13.12	Whether color coding is being used for easy identification of different type of cylinders and hoses?	
13.13	Whether cylinder keys are available near the cylinder?	
13.14	Whether gas torches with flash back arrestors of approved make are only being used?	
13.15	Whether pressure gauges are in working condition and checked from time to time?	
13.16	Whether welding shields are used while welding?	
13.17	Whether proper earthing for welding machines are provided?	
13.18	Whether power is taken from approved sources (welding receptacles)?	
13.19	Whether welding receptacles are properly grounded?	
13.20	Whether welding cables are maintained in good condition and without any joints/ cuts?	
13.21	Whether to avoid short circuit, welding machines are protected against rain?	
13.22	Whether earth connectors are securely connected to the job and not to the adjoining pipeline or structure?	

Section 14: Safety in electrical jobs.

Safety during gas cutting, grinding, and welding is paramount in industrial operations, particularly in environments like an oil refinery. These processes involve high temperatures, flammable materials, and potentially hazardous fumes, making strict adherence to safety protocols, proper training, and the use of appropriate personal protective equipment critical to prevent accidents, fires, and exposure to harmful substances.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
14.1	Whether the provisions for temporary installations as per clause 09 of OISD-STD-173, fully complied.	
14.2	Does the contractor engage electrician(s) having valid electrical license in line with provisions of Central Electricity Authority (CEA).	
14.3	Has the Electrical Line C earance procedure been followed involving electrical and other concerned Dept. and filling of formats?	
14.4	Have Danger Signs with Voltage rating/ Men at work signboards been displayed at both Sub Station as well as the work site?	

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14.5	Does the system exist for inspection & approval of electrical equipment (DG sets, Panels etc.) by the competent person/ authority before being put to use.	
14.6	Whether the cables from switchgear panels to portable equipment/ lighting transformers/ field distribution board are running in orderly manner with no insulation damage/ no joints.	
14.7	Are the cables/ wires identifiable along their route towards the load by using colour coding and or markers.	
14.8	Is the standard practice for termination of cables (i.e. proper lugs, crimping, cable glands etc.) being followed. Is cable armour in continuity from feeding point to load point.	
14.9	Are the ELCB used on the incoming side to protect against the current leakage. Is the device tested every time before start of work.	
14.10	Are all the portable appliances provided with insulated three pin plug & socket arrangement.	
14.11	Whether only industrial type extension boards & plug sockets used at all sites.	
14.12	Whether electrical PPEs (hand gloves, insulating mats, fuse pullers etc.) are available and maintained in good condition.	
14.13	Whether CO2 fire extinguishers to control electrical fires are available and periodically tested?	
14.14	Visual inspection of electrical equipment for damaged cables, loose connections, improper earthing and exposed live parts.	
14.15	Whether all portable lights and tools are flame proof or intrinsically safe when working in a confined space where there is a potential flammable or explosive atmosphere.	

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Section 15: Safety in abrasive blasting and painting jobs.

Ensuring safety during abrasive blasting and painting jobs in an oil refinery is essential to protect workers, prevent environmental damage, and maintain the integrity of equipment and structures. These tasks involve various hazards, including exposure to hazardous materials, respiratory risks, confined space work, and the potential for falls. This contractor safety audit checklist is designed to help refinery operators and contractors systematically assess and enhance safety measures during abrasive blasting and painting activities, promoting a secure work environment and regulatory compliance.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
15.1	**General**	
15.1.1	Confirm that abrasive blasting is used only after getting approval from competent authority / work permit?	
15.1.2	Confirm that air compressor used for abrasive blasting are positioned away from workplace.	
15.2	**Respiratory Protection**	
15.2.1	Confirm that workers are provided with the correct type of respirators for the tasks, and they are fit-tested and trained in their use.	
15.2.2	Check that respirators are maintained, cleaned, and stored properly.	
15.3	**Ventilation and Dust Control**	
15.3.1	Inspect the availability and effectiveness of local exhaust ventilation systems to control dust and fumes.	
15.3.2	Confirm that dust collection systems are properly maintained and functioning.	
15.4	**Equipment Inspection**	
15.4.1	Check that abrasive blasting equipment, including blast pots, hoses, nozzles, and paint spraying equipment, is in good working condition.	
15.4.2	Confirm regular equipment inspections, maintenance, and safety checks are documented.	
15.5	**Paints and Coatings**	
15.5.1	Confirm that workers are trained in the safe handling and disposal of paints, coatings, and solvents.	

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15.5.2	Confirm that hazardous materials are stored and labeled properly.	

Section 16: Safety in Radiography.

Safety in radiography within an oil refinery is crucial to protect personnel from radiation hazards and Confirm compliance with regulatory requirements. This specialized safety audit checklist focuses on Confirming the qualifications of radiography technicians, inspecting radiation equipment, ensuring proper shielding, monitoring individual exposure levels, and confirming adherence to safety protocols. Additionally, it assesses emergency response plans and the availability of radiation detection equipment. By conducting regular safety audits using this checklist, oil refineries can maintain a secure environment during radiography activities, mitigating the risk of radiation exposure and ensuring regulatory compliance.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
16.1	**General**	
16.1.1	Are safety precautions for handling of source as per guidelines of AERB being followed?	
16.1.2	Is the potency of the source being used within acceptable limits as per the AERB regulations?	
16.1.3	Whether Radiation Safety Officer is available at site?	
16.2	**Qualified Personnel**	
16.2.1	Does the radiographer have valid certificate of radiography from competent authority (AERB)?	
16.3	**Equipment Inspection**	
16.3.1	Is the area being cordoned with proper signs during radiography as per guidelines of AERB?	
16.3.2	Confirm that radiographic equipment, including X-ray machines or gamma-ray sources, is in good working condition and has up-to-date inspection and calibration records.	
16.4	**Radiation Safety and Exposure Control**	
16.4.1	Is radiographer using Exposure Meter / Dosi Meter?	
16.4.2	Whether minimum occupancy of the premises / workplace is being monitored?	

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Section17-21: Safety check list in various jobs as tabulated:

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
17.0	**SAFETY WHILE WORKING NEAR OR ABOVE THE WATER BODIES**	
17.1	Are the provisions as per clause 6.16 of OISD-GDN-192, being complied with.	
17.2	Are the sufficient provisions like safety nets, life buoys, life jackets, boats etc. available?	
17.3	Are rescue & emergency procedure in place for any eventuality?	
18.0	**NOISE POLLUTION RELATED SAFETY**	
18.1	Are there construction sites where continuous noise level exceeds 85 Decibels	
18.2	Is the noise level monitored? Explain the mitigation measures for high noise level equipment/ areas.	
18.3	Are the high noise areas, (i.e., the areas where verbal communication is difficult), been identified.	
18.4	Are approved hearing protection devices used by workers/ employees working in high noise areas (>85Db).	
18.5	Are the employees exposed to continuous noise level above 85 Db, tested periodically for audiometric test.	
19.0	**TRANSPORTATION, LOADING AND UNLOADING**	
19.1	Is any written down procedure available for material movement inside the premises? How to Confirm implementation of procedure?	
19.2	Is any written down procedure available for material loading unloading?	
20.0	**STORAGE AND PRESERVATION**	

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20.1	Whether material like pipes, tubes, fittings etc. are stored with proper manner (stacking, tagging, capping)?	
21.0	**Safety in Road work**	
21.1	Whether site is barricaded and provided with warning signs including night warning lamps/ self glowing markers at appropriate location for diversion of traffic?	
21.2	Whether mixing aggregates with bitumen is done with the help of batch mixing plants? If no, whether adequate precautions have been taken?	
21.3	Whether road rollers, bitumen sprayers, pavement finishers are driven by experienced drivers with valid driving licenses?	
21.4	Whether the worker handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate are provided with PVC hood, hand gloves rubber shoes (gum boot) with pegging upto knee joints?	

Section22: Documentation and Quality assurance plan

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
22.1	Whether procedure is available for handover of as built/ final drawing, documents, datasheets, 3D model, Isometrics etc. to owner for future reference.	
22.2	Whether guidelines for quality control and assurance procedures and specifications for asset are available and implemented to Confirm that material, construction, and procedure (fabrication and inspection) during the fabrication stage are in accordance with the design specifications?	
22.3	What is the procedure of positive material identification (PMI) to identify metallurgy mismatch? What are the stages of PMI?	

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Section23: Welfare facility

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
23.1	Are the welfare related facilities as per factories act provided, not limited to following: -Canteen (Neat & Hygienic) -Drinking water facilities - Shelters for rest room - Toilet facilities(ladies/gents) -First Aid Boxes	
23.2	Does the system exist for review of basic amenities on the labour camps viz.: -Drinking -Washing facilities -Adequate carpet area for family members. -Protection from mosquitoes menace. -Clean to lets	
23.3	Are the first aid & rescue facilities available at each site like: -First aid boxes -Qualified first aider -Ambulance (s) -Visiting doctor	

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Section24: General

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
24.1	Does the system exist to encourage reporting of near miss, unsafe act & unsafe condition.	
24.2	Does the system exist for encouraging the house keeping at site?	
24.3	Whether any system is available for construction waste management?	
24.4	Are there adequate safety promotion displays at the site (i.e. posters, Banners, Signages, Slogans etc.)?	
24.5	Whether waste bins are provided at each site for collection & regular disposal of wastes.	
24.6	Is communication system adequate?	
24.7	Are road barriers being used for blocking any roads/passage?	
24.8	Has the structure been adequately secured against storm/high winds during construction/ erection?	
24.9	Are only proper clothes and not loose clothes being used while working around machinery?	
24.10	Is the speed limit for vehicles inside the plant duly notified & followed. Please mention speed limit.	
24.11	Does the system exist for checking of vehicles before their deployment at site and regular checking thereafter.	
24.12	Does the system exist for penalty in case of violation of safety norms.	
24.13	Whether all moving parts of equipment provided with safety guards	
24.14	Are the floor openings, service pits etc. always covered or protected by guard rails or equivalent system.	
24.15	Whether adequate covered area is provided at each site to Confirm smooth & safe working during unfavourable weather conditions. Please mention the ratio of total area Vs covered area.	

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24.16	Whether separate area is earmarked for warehousing the combustible materials (i.e., diesel, lube oils etc.), with adequate fire extinguishing equipment. Are the statutory provisions complied?	
24.17	Whether Boundary wall / Barrication constructed surrounding the project area?	
24.18	Is access system available for contract workmen and employees?	
24.19	Whether motorable access road is available for all the sites?	
24.20	Whether fire and rescue tender is available?	
24.21	What type of security system available i.e., CCTV, security guards, Drone vigilance?	

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WRITE A BRIEF ABOUT HSE PRACTICES OF YOUR SITE

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Bharat Petroleum

energising lives

BPCL CORPORATE SAFETY MANAGEMENT SYSTEM

Technical Standard on Project Safety Management

(BPCL /CSMS/TS/05)



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Issued By	**GM, Corporate -HSSE**
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Corporate HSSE
Bharat Petroleum Corporation Limited
"A" Installation, Sewree Fort Road, BPCL Complex, Sewri
Mumbai, Maharashtra - 400015

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1.0 Purpose

BPCL has developed Corporate Safety Management System (CSMS) which defines specific requirements for managing OHS risks across its operations in accordance to its HSE policy and stakeholders expectations. The **Element 5 of Corporate Safety Management System : Planning, Standards and Procedures** requires that BUs establish project safety management plans and procedures to ensure safety during construction and commissioning of new installations or modernization/ expansion projects.

This Technical Standard outlines project safety management requirements,which should be integrated in all new (i.e. green field projects) as well as modernization or expansion projects (i.e. projects within or adjacent to existing locations/plants).

2.0 Applicability

This Techniacl Standard applies to Project Functions of respective Business Units and their project locations. **The scope of Tehnical Standard covers both i.e. new projects at greenfield locations and modernization/expansion projects within or adjacent to existing BPCL plant/location .** The project contracts includes here combination of all activities such as Construction, Erection, Modifications, Expansions, Maintenance, Demolishing, etc to be done within specific budget and time frame. These are typically managed by project function and can be a very large projects at times. The TS shall apply to all contractors/sub-contractors hat provide services solely to the Project.

The plan is to be implemented by the Contractors/ project management consultant, if applicable and its application will be monitored/ audited by BPCL.

3.0 References

BPCL HSE Policy
BPCL Corporate Safety Management System
BPCL Technical standard on Risk Assessment and Management
BPCL Technical standard on Contractors Safety Management (TS/01)
The Building and Other Construction Workers (Regulations of Employment and Conditions of Services) Act and State Rules as applicable to BPCL Project Site

4.0 Responsibilities

Corporate HSSE shall be responsible for training , communicating and monitoring of this technical standard in BU and their project locations.

BU- HSSE/ Location- HSSE shall be responsible for implementation of this technical standard at their project locations.

BPCL Project Leader responsibility shall include(but not limited to)

- Ensuring legal compliances related to project activities;
- Ensuring that tenders/bids for contracts contain sufficient information to enable an evaluation of the safety risk and control measures associated with the work activity;
- Ensuring a contractor pre-prequalification process is applied that evaluates the safety systems, capability and performance of companies prior to work commencing;
- Provide information relating to the hazards associated with project activities and the risk control measures designed to prevent injury and/or loss;
- Review , monitoring and enforcement of a documented project safety plan of EPC contractor;
- Establish a system for daily job safety planning, risk assessments, training, performance monitoring, auditing and inspection of contractor activities at the project location;

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- Ensuring that workers get adequate instruction, information, training and supervision;
- Sharing good practices to promote continuous improvement in contractor and BPCL safety performance;
- Effective motivation and disciplinary policy.

Project Leader shall define the project management organizational structure , roles, responsibilities and accountabilities for all personnel who play a role implementing the Project Safety Management , including:

- Project Management Consultant, if applicable
- Area In-charges;
- BPCL HSSE Professionals;
- Human Resource
- Any other department under project
- Supervisors;
- Safety staffing of contractors

Refer **Appendix 1** for Guidance on Responsibilities.

5.0 Existing Applicable Laws

BU/ Locations shall ensure that their operations comply with all relevant Indian Environmental, Health and Safety laws and regulations and obtain statutory permissions/approvals prior to start of the work.

6.0 Project Safety Management

a. Contractors' safety Management is vital to prevent any accidents and incidents that have harmful impact on employees, the community, assets and the environment. This can be achieved by:

- Clear communication of BPCL's safety management system(SMS) requirements to Contractor(s)
- Verifying the gap(s) between the Contractor's SMS and BPCL's Requirements and
- Establishing and implementing Mechanism for monitoring and ensuring compliance of BPCL SMS requirements

b. Key areas for project safety management include but not limited to:

- Project team leadership and commitment
- Prequalification and selection of competent project contractor
- Communication of project specific safety requirements in contract documents
- Comprehensive project safety plan preparation by contractor or project management consultant and approval by BPCL project owner / owner's representative
- Pre-job meetings / Tool box talks
- Induction and specialized training
- Daily job plan
- supervisory safety responsibility
- Monitoring/supervision of critical tasks
- Daily equipment and work area inspections
- Active project safety committee
- Joint safety walks
- Method statement
- Safe equipment and tools
- Effective control and monitoring on alcohol and drug abuse policy
- Execution of the work &performance Monitoring
- Post contract evaluation
- Effective motivation and disciplinary policy

6.1. Management Commitment & Accountability

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BPCL project team at all levels, is dedicated to assuring that its employees and others are provided a safe and healthy place to work on each of its projects and ensuring that the Zero Harm philosophy is executed. The management should take the lead and demonstrate commitment throughout the project by:

Treating safety management as a core value of the project and demonstrating leadership throughout the project.

Developing shared objectives and promoting team building between BPCL Project Management Team and Contractors organization's / Project Management Consultant.

- Providing adequate resources and competent safety professionals
- Visibly promoting safety in regular meetings and by doing regular safety walks /**Location** visits with their counterparts.
- Setting safety objectives and targets and by measuring and reviewing performance.

6.2. Pre-Qualifications & Selection of Project Contractors

a. BU/ Locations shall develop and maintain a process for pre-qualification and selection of project contractors relevant to their needs and demonstrate continual improvement of the same.

b. While selecting / pre-qualifying the contractors, consideration shall at least be given to:

A. Contractor's Past Safety Performance

a. Worker's Compensation Payout (last 3 years)
b. Number of Fatal Incidents (last 3 years)
c. Reportable Lost Time Injury Frequency Rates (last 3 years)
d. Pending court cases, if any

B. Safety Capabilities Assessment

a. Contractor's Company Safety Policy
b. Contractor's Company Safety Organization
c. Safety Management System Manual of the contractor
d. Hazard Identification & Risk Management Program
e. Accreditation (ISO 9001/ ISO 14001/ OHSAS 18001) / Performance Awards
f. 3rd Party / Client Audits Report of similar previous jobs undertaken by them

c. Contractors safety pre-qualification evaluations shall be performed by a team of designated officials from Contract Owners / Owners Representative; Procurement, HSSE, Finance etc. considering the other risks such as commercial etc.
d. Procurement / Owner department shall ensure the completion of any requirement, further highlighted by HSSE Staff before qualifying the contractor.
e. Once the contractor is qualified, his name shall be maintained in contract department's database of competent project contractors and their safety pre-qualifications information.

6.3. Communicating Project Specific Safety Requirements in Contract Documents

a. Locations shall determine project specific work specific safety requirements. These Project Specific Safety Requirements shall be communicated to all pre-qualified contractors in bid documents by contracting department.

The project specific work specific safety requirements, which may be included are (but not limited to):

- Valid Registration Letter issued by BPCL
- Contractor's Safety Organization specific to project

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- Hazard Identification and Risk Management Procedures
- Applicable Risk Assessment Studies like HAZOP, HAZID etc.
- Project Safety Management Plan
- Method Statement(s)/(safe work procedure) for all hazardous or potentially jobs as defined by owner department.
- Any additional document/procedure/study as identified by BU/location.

Contracting department shall ensure that contractor submit all the applicable safety requirements as listed above. HSSE department shall be consulted if needed.

6.4. Project Safety Management Plan

Contractor shall submit a detailed Project Safety Management Plan in BU prescribed template. This shall be a comprehensive document defining safety management system for the project and shall be reviwed/approved by BPCL project owner/ representative, prior to start of the work (Refer **Appendix 2** for a sample Template for a Project Safety Management Plan) .

Note : BU/Location may not require a detailed Project Safety Management Plan as per Appendix 2 for a small or short term project. However, a shorter version of plan shall always be necessary to show that that the hazards are recognized and understood is likely to be adequate.

6.5. Project Safety Organization

The project safety organization shall vary according to size and complexity of projects. A typical project, however should include :

A. Chief Project HSSE Manager- HQ
B. Senior Project HSSE Managers- Region
C. Project Engineers
D Fire and Electrical Officer (as may be applicable)
E. Contractor's Safety Officers
F. Contractor's Safety Supervisors

6.6. Contractor's Safety Organization

Contractors must provide a nominated manager, supervisor or foreman with authority to give and receive safety instructions at project location as mentioned below.

- If a contractor is employing less than 30 employees, he shall designate one dedicated supervisors as a safey steward.
- For every 30 persons or more contractor shall appoint one qualified safety steward (diploma in industrial safety from recognized government institute). For more than one safety steward, one of them shall be appointed as Chief safety steward.
- In addition to above contractor shall also appoint one safety officer, if he employs more than 100 workers. Safety officer shall have Diploma in Industrial Safety or any equivalent qualification from Government Recognized Institute and minimum 2 years of experience. For more than one safety officer, one of them shall be appointed as Chief safety steward.

NOTE: BPCL shall reserve the right to prescribe the number and qualification of contractor's safety personnel.

Appendix 3 provides description of Contractor's Roles and Responsibilities. **Appendix 4** provides list of facilities /equipment for the contractor's safety function.

6.7. Inadequate Safety Personnel

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In case if the contractor fails to provide the minimum required manpower or fail to fill up vacancies created within 30 days, the same shall be provided by BPCL at contractor's cost. Any administrative expenses involved providing the same like paper advertisement or manpower consultant charges, etc shall also be at the cost of contractor.

6.8. Approval of Safety Personnel from BPCL

The name of the nominated person(s) must be given to the BPCL Representative before work commences along with their educational qualification and training certificates. The Contractor shall be fully responsible for supervision of Contractor personnel to ensure that they strictly adhere to all applicable safety requirements. The Contractor shall provide, and fix in place, all caution and hazard notices required for the project location in accordance with the applicable laws in force and industry practice.

6.9. Subcontractors Control

The Contractor shall provide the BPCL Representative with the names of the Sub-Contractors and obtain approval to this Code of Practice prior to their engagement. Contractor shall ensure that the sub contractors shall also be governed by the requirements as applicable to them. The contractor shall ensure that the Sub-Contractors receive safety induction briefings. The Contractor shall regularly check the Sub-Contractors' compliance with safety requirements and be held accountable for their safety performance including requirement to use Personal Protective Equipment (PPE).

6.10. Kickoff Meeting

The contractor shall facilitate a formal safety kickoff meeting prior to commencement of Location works along with subcontractors and BPCL representative. The contractor shall inform the BPCL a minimum of seven (07) days in advance of these formal kickoff meetings and the BPCL.

6.11. Project Safety Committee

A project safety management committee shall be constituted with representation from senior management representation from the contractors, subcontractors (if permitted in contract).The meeting shall be held at least once per month and record maintained. The meeting shall be chaired by BPCL project manager and convened by Location HSSE Manager.

The large contractors/ sub-contractors may also be asked to constitute their own safety committees. will provide the BPCL the minutes of the same.

The outcome of pre job meeting shall be documented and record maintained.

6.12. Hazard Identification and Risk Assessment

The contractor shall ensure that a specific hazards are identified, which have the potential to cause harm in terms of human injury, ill health, damage to property or the environment, or a combination of these and risk is properly assessed, control measures are identified prior to start of work. The record shall be maintained at Location office.

6.13. Safety Instruction & Training

Project Leader shall establish safety training plan & procedures (example given below).

Training Profile Discipline: Scaffolder	Initial Training
Safety Orientation & BPCL HSE Policy, Life Saving Rules, Roles & Responsibilities, Incident Reporting, Emergency management, Project description, hazards & risks, Project Safety Management Plan etc.	Prior to starting work- All BPCL and Contractors Employee

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Scaffolder Practical Assessment	Prior to starting work
New Start Orientation	Prior to starting work
Correct use of PPE	Prior to starting work
Safe use of Safety Harness and 100% Tie-Off	Prior to starting work
Working at Height & Dropped Object Controls	Prior to starting work
Toolbox Talk	Prior to starting work
Hazard Identification and Safety Intervention	Prior to starting work
JSP and Work Permit System	Prior to starting work
First Aid	As required
Worker Welfare Program	Prior to starting work
Environmental Awareness Program	Prior to starting work
Transport Safety Awareness	Prior to starting work
Safe Commissioning and Start up to concerned personnel	Prior to Commissioning and Start up

The contractor shall ensure that all personnel attend the Safety Induction Training / Instruction, Tool Box talks before they start to work on the project. The contractor's workman shall attend Refresher Training Periodically and shall take advantage of the various Safety training courses provided by BPCL.

A record of the Safety training undertaken by staff shall be maintained and available to Employers Representative on demand.

6.14. Daily Job Safety Plan

The Contractor Job Representative shall prepare daily job safety plan to identify specific tasks, their hazards and risks and control measures. This is a joint formal review of all tasks and to be documented. This shall be reviewed and approved by owner or his authorized representatives.

6.15. Safety Communication

The Table 1 below outline the indicative methods and schedule for Contractor Specific Health and Safety communication for processes identified for all employees.

Table 1 : Indicative Communication Workplace Schedule:

Communication Process	Schedule	Participants	Facilitator
Toolbox Meeting	Daily	Contractors and its subcontractors	Respective Contractors Supervisors in charge of work activities
Safety Meetings	As scheduled	Contractors	BPCL HSSE Manager
Project kick Off Meeting	Prior to project commencement or first day on-Location	BPCL Construction Team, Contractors and its subcontractors	BPCL HSSE Manager/ Contractors Safety Officers/ Stewards

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Mass Tool Box Meeting	Weekly	BPCL Construction Team, Contractors and its subcontractors	BPCL Project Manager Contractor Front Line Supervision and Contractor safety stewards
Safety "Stand Down"	As and when required	Specific task group	Contractor project Manager / Contractor Construction Manager
Emergency drill exercise	Monthly	As per emergency response plan	Contractor Project Manager / Contractor Construction Manager

6.16. Toolbox Meetings and Mass Tool Box Meeting

Daily toolbox meetings shall be conducted prior to commencement of operations to raise the safety awareness of all project personnel- Meetings shall be carried out at the workface. Toolbox meetings shall comprise information of discussions concerning any inherent hazards associated with planned works as well as precautions that will be initiated. Topics for toolbox meetings shall include risk assessments conducted for work activities. Toolbox meetings shall be conducted at the common resting shed and designated Contractor personnel will provide assistance to Contractor Supervisors in the preparation and delivery of safety talks and other relevant matters. Refer **Appendix 5** for Guidance on Tool Box Talk.

Mass Tool Box Meetings will be conducted by BPCL Project Manager /Contractors to address workforce common issues, communicate corporative messages, and discuss Lesson Learns and / or safety programs new initiatives.

6.17. Monthly Location Walk Through

Contractors shall conduct Monthly Location Walk Troughs comprising Contractors Location Management and Safety Coordinators. BPCL project management and HSSE role holders will join these inspections on regular basis.

6.18. Safety Audits

Internal Project Safety Audits will be undertaken in accordance with the Project Safety Management Plan. Regional Project Head shall decide about the external safety audit from Indepdent third party agencies or BPCL auditors (other than Project) as may be required on case to case basis.

6.19. Safety Statistics

Contractors' safety statistics shall be gathered on a monthly basis and reported to the BPCL HSSE Manager. Contractors and its subcontractors shall provide details regarding their monthly statistics to BPCL for collation by the 5 th calendar day of every month. Monthly Statistics shall be communicated at a prominent place. Refer Appendix 6 for indicative safety statistics to be maintained at each BPCL project Location as minimum.

6.20. Project Safety Management Basic Rules

Refer **Appendix 7** for Project Safety Basic Rules.

6.21. Equipment and Machinery Safety

All plant and equipment intended to be used at the project contractors and its subcontractors shall conform to the manufacturer's specifications shall have a proof of adequate maintenance regime. In

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addition to these requirements, Contractor shall comply with all regulatory authority standards for machinery guarding and warning devices shall be adhered to prior to the operation of the plant and or equipment on the project.

Contractor shall keep records of all inspections; third party certifications (when applicable) and maintenance activities inclusive of breakdowns shall be recorded using the logbook provided for the relevant item of plant.

All plant items shall be provided with a logbook that contains:

- Current copy of registration/certificate or licence, where applicable,
- Records of service,
- Operation manual,
- Daily pre-start inspection checklists (as applicable),Maintenance records for prior history and provision for future entries, and
- Mobilization inspection checklist completed by en appropriately qualified or competent person.
- Authorized operators record

Vehicle and Plant maintenance will be carried out to manufacturer's specifications and maintenance schedule.

Colour-coding and frequency of maintenance are to be indicated clearly in the maintenance regime of all equipment and machinery.

Unless all the required licenses required to operate any equipment are held by the operating employee and have obtained the necessary work permit approval, then that equipment will not be operated.

BPCL and Third parties will audit the inspection protocols and inspection records.

6.22. Pre-Start Inspections

Supervisors and operators shall ensure equipment and vehicles are inspected prior to operation each shift. The operator shall enter details of the inspection into the logbook or daily checklist of the person delegated to complete the inspection. All safety devices shall be operative and at all times used. All required certificates should be available, current and valid

6.23. Equipment and Machinery Inspection Register

Contractor construction team shall maintain a Plant and Equipment Register to systematically record each item of plant brought to the project location, which will determine inspection levels, registration details and logbook requirements. All safety devices shall be operative and at all times used as well as all required certificates, all required certificates should be available current and valid

BPCL Team and Third parties will audit the inspection protocols and inspection records

6.24. Lifting Machines (Cranes, Rigging, Lifting and Mobile platform)

The use of lifting machines in the project location shall abide by the following conditions:

- Current applicable regulation shall be complied with at all times.
- Lifting machines (i.e. cranes, piling machines) shall possess a valid Inspection Certificate and such certificate must be displayed on the machines.
- Contractor Project engineer and lifting supervisor shall inspect the lifting machines upon arrival at project location before being permitted to be used.
- A statutory competent person shall examine the lifting machines at least once in every 12 months. All required certificates should be available, current and valid.
- The Load Capacity Chart (manufacturer or certified by Authorized Examiner) shall be displayed on the lifting machines and understood by the operators.

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- Lifting machines shall be marked with its safe working load (maximum and minimum radius)
- Lifting machines shall be used in accordance with manufacturer's operating instruction and/or the Authorized Examiner's instructions
- Lifting machines shall be provided with.

  -An adequate braking mechanism
  -A swing lock or swing brake capable of prevention of rotation;
  -A brake or other device adequate to bring the crane to a stop from any travel for which it is designed, together with a means of locking the crane so as to hold its stationary
  - a load and/or radius indicator with warning alarm
  -a load/radius table to be available in the crane cab of every variable radius jib crane
  -an automatic safe load indicator (Load Moment Indicator)
  -anti two blocking devices
  -crane hook with a safety catch to prevent displacement of the sling or load from the hook
  -an anemometer or a wind speed meter (for new cranes) for measuring wind force and velocity
- Lifting machines shall be examined by an Authorized Examiner after any major repair or any repair done on the hoisting or operating mechanism, boom jib and after over loading incident
- Excavators shall not be used for lifting operations.
- No lifting machine shall be operated unless all measures are taken to prevent toppling or overturning or contact with overhead obstruction (such as structure, power lines)
- When moving lifting machines, the boom shall be lowered and traffic controller/guide shall be required to guide the lifting machine operator.
- When lifting machines are reversing, an additional person shall be required to ensure that the path of travel is clear.
- Lifting machines cabin shall be locked when it is not attended by the operator. Unauthorized person(s) shall not be permitted to enter in the cabin or operate the crane.
- Fire extinguisher shall be provided in the lifting machines. Operator shall be trained to use fire extinguishers.
- Good housekeeping of the lifting machine shall be exercised and maintained.
- Safe access (with proper foot and hand holds/supports) to the cabin and deck of the lifting machines shall be provided and identified.
- Lifting machines shall be maintained to ensure that all components of the lifting and operating mechanism are in good, safe and sound functioning condition.
- A maintenance program shall be required and implemented effectively for the lifting machines and the maintenance records shall be kept in the cabin.
- The operator shall carry out daily inspection of the crane and testing of the safety devices In accordance to manufacturer's recommendations.
- The maintenance section of respective supplier shall inspect the lifting machines at least once every month.

6.25. Lifting Operations

- BPCL requires that all lifting to be executed as a minimum, under compliance with applicable regulations and approved code of practices.
- Contractors shall appoint trained and competent Lifting Supervisors Riggers, Signalman and Crane Operators In accordance to statutory requirements.
- Contractors shall also appoint a Responsible Person to coordinate lifting activities.
- Method statements, risk assessments and Work Permit System shall be implemented for all lifting operations.
- A Lifting Plan shall be established and implemented for all routine and non-routine operations.

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- The Lifting Plan shall be submitted together with the Lifting Checklist prior to commencing lifting operations. Designated lifting points and the lifting path shall be drawn in the Lifting Plan .o The Lifting Plan shall also indicate the followings:
  - Location of lifting operation;
  - Description of lifting operation;
  - Weight of load;
  - Description of lifting equipment to be used;
  - Personnel involved in the lifting operation
- Appointed lifting supervisor shall also check and ensure that all safety provision are in place before the lifting operation is commenced with checklist(s) provided.
- The lifting operation area and other areas with potential hazard / danger must be cordoned off to prevent access for all unauthorized personnel. Only authorized persons and personnel involved in the lifting are allowed in the lifting operation area.
- The load shall be controlled by means of tag lines to prevent the load from turning, swaying or swinging.
- The crane operator/lifting machine operator shall be medically and physically fit for the job and possess the following qualifications.
  - valid crane operator license issued by Government department; and
  - certificate of competency for the type class/capacity of the crane.
- Contractors shall submit the respective documents and certificates on the above for verification to BPCL

6.26. Safe Work Procedures

The contractor shall develop and implement a safe system of work and procedure/ method statement at each Location. A copy of procedures shall be submitted to BPCL Representative prior to commencement of the work.

This shall include but not be limited to:

- BPCL 12 Life Saving Rules
- Safety Signage
- Hazard Identification and Risk Assessment Procedure
- General Safe System of Work
- Lay out, Housekeeping and Traffic
- Working at heights, ladders, Scaffold and Working Platform
- Use of electrical plant and hand tools
- Material Handling
- Heavy earth moving equipment
- Digging and Excavation
- Hot work
- Dust & Fumes
- Control of hazardous Substances
- Electrical hazards, especially in the connection of equipment supplied by BPCL, or their Subcontractors, to power sources provided by others
- Confined spaces (as applicable)
- Noise, Lighting, Heat Stress, Extreme whether
- Store & waste management
- Portable tools & equipment
- Induction Checklist Drugs and Alcohol
- Safe Lifting & Rigging Procedures
- Material Handling Equipment Operations Ladder Safety

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- Portable Hand Tool / Power Tools Safety
- Personal Protective Equipment (Selection, Use & Maintenance)
- Waste Storage, segregation & disposal procedures
- Competency Criteria for High Risk Activities (Qualification / Experience / Training / Skills)

6.27. Scaffolding and Work Platforms

Erection, alteration and dismantling of any scaffold shall be carried out by a person holding the appropriate certificate of competency and under the direct supervision of a qualified scaffold supervisor. The use of scaffolds shall be governed by the IS codes.

6.28. Personal Protective Equipment (PPE)

PPE that shall be required for all personnel including visitors whilst they enter project Location. Areas where personal protective equipment is required to be worn shall be prominently displayed with signs. Instruction on the correct use and maintenance of personal protective equipment shall form part of the nominated training and toolbox sessions and reiterated through the pre-start meeting process. Contractors shall establish and implement a PPE maintenance programme.

The Contractor shall remove from the location any worker who consistently refuses to wear the appropriate personal protective equipment. The PPEs and safety appliances provided by the contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS) or equivalent standard.

All construction workers should be provided with high visibility Jackets with reflective tapes confirming to the requirement specified under BS EN 471: 1994. The contractor shall at all time maintain a minimum of 10% spare PPEs and safety appliances and maintain proper record. The standard PPE may include:

- High visibility Vests
- Fire Retardant Clothing (particular activities and designated areas)
- Portable gas detector (particular activities and designated areas)
- Toe Protection and steel capped safety footwear with ankle support
- Hearing protection (particular activities and designated areas)
- Respiratory protection (particular activities and designated areas)
- Hand Protection (particular activities and designated areas)
- Safety helmet with chinstrap
- Safety Goggles.
- Eye protection for grinding, welding and cutting, compressed air use and chemical interaction
- Full body harnesses attached to a shock absorbing device and with double lanyard ("Y" type)
- Life Jackets (designated area)

Safety Induction shall be used as a forum to advice on the general personal protective equipment.

6.29. Location Familiarization

Location familiarization is an essential part of the Location Safety arrangements. The contractor shall provide its employees a familiarization tour to their work area for their personnel prior to commencement of the work. This shall include:

- Boundary of work location.
- Authorized safe access / egress routes.
- Authorized walking Routes.
- Storage areas for various materials in particular where dangerous materials or substances are concerned.

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- Location of key Personnel, e.g. BPCL Project Manager, HSSE office etc.
- Arrangements for sanitary conveniences and washing facilities.
- Location security arrangements.
- Identification of physical hazards associated with BPCL operational or other work activities.
- Assembly points during emergency.

6.30. Certificates of Competency

BPCL requires the Contractors to maintain a register with all statutory certificates of competence as their qualified personnel. These records shall be kept on Location for auditing purposes.

Where BPCL requires personnel to have certificates of competency to perform designated tasks, a record of the certificates will be taken at the time of employment or induction prior to employees being able to perform those tasks. The records shall be maintained in a register for Auditing purposes

Competency certificates shall be maintained for:

- Issuing work permits
- Conducting Electrical Work
- Scaffold work
- Lifting Operations / Safe Slinging & Rigging
- Crane / forklift operators
- Fire Fighting

6.31. Location Access Control and Traffic Management

Contractors shall manage the security at BPCL project premises. Security guards, traffic patrols, traffic wardens, heavy equipment escorting, vehicle access, warehouses, access and exit gates will be managed by Contractors under procedures and regulations agreed with BPCL Project Team Management.

Only authorized employees with a current and valid driver's license will be allowed to operate vehicles on the project. Contractors shall train all their drivers in defensive driving principles.

6.32. No Smoking Policy

BPCL follows No Smoking Policy at the work Location and same shall be practised at all its project locations. The cigarettes / bidis, lighters, match boxes etc. shall not be permitted to the project Location.

6.33. Drugs and Alcohol

The use, possession, distribution or sale of illegal drugs and controlled substances by any BPCL employee, visitors, contractors or sub-contractors and their employees while on BPCL premises or while performing services on the BPCL project Location is strictly prohibited. Breath analyzer test shall be conducted at the Location regularly.

6.34. Notices and Signs

Contractors shall display prominently relevant safety notices and signs in such a manner as to ensure personnel in the vicinity are made obviously aware of the potential hazard. Posters shall be utilized within amenities as a general reminder and changed on a regular basis to reduce familiarity. Signs shall be generated following Indian regulations.

6.35. Barricading and Shuttering

Barricades are designed to restrict access into work areas where hazardous conditions are prevalent. Shutters and roof supports are designed to protect access to trenches, tunnels, drains, sewers etc.

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Contractors shall identify and adequately highlight potentially hazardous areas or processes and particular risky activities by displaying appropriate tag, warning sign and where deemed necessary, bunted off with fixed rail barricades. Contractor shall erect fixed temporary guardrails at entry points to areas requiring the removal of permanent guard railing or other means of fall protection, Other situations include:

Overhead Work.

- Confined Space Entry;
- Scaffold erection and protection;
- Chemical and product spills;
- Traffic and pedestrian control;
- Blasting and charging situations;
- Excavation
- Hot work
- Painting
- Electrical equipment

6.36. Working at Heights

Working at heights may cause serious injuries or fatalities. It is therefore essential to ensure the following measures are taken by Contractors prior to commencing any work at height:

- Permit to work system shall be implemented for working at height
- Where work is performed/or lifted to heights greater than 2 metres above the ground, the potential drop zones must be cordoned off
- Pipe work and structures that could deflect falling objects will be considered when assessing the potential drop zone
- All work areas, walkways, platforms etc. elevated 2 meter or more, must be encompassed by an approved guard rail or rope
- All barriers such as guardrails, opening covers are adequately provided with warning signage must be to protect all workers and public from injury
- Tools and materials will be raised and lowered in secured containers
- When work is carried out at elevated levels, the area below must be cordoned off and warning signs must be posted up
- All openings in floors must be covered temporarily or securely fenced.
- Appropriate Personal Protective Equipment (PPEs) for fall arrest such as full body harnesses attached to a shock absorbing device and with double lanyard ("Y" type) shall be used for work at heights. It is to be used at height of 2 meters and above.

6.37. Housekeeping

Housekeeping shall be considered an extension of every activity on the project. Contractors shall ensure maintaining a high standard of housekeeping in the Project at all times. Contractors' supervisors shall be responsible for ensuring housekeeping inspections are conducted on a daily basis and corrective actions are taken accordingly. The areas within their control are to be maintained

in a tidy, safe condition, materials and equipment not in use are neatly stacked away from the work areas and clear of access ways and emergency exits.

Housekeeping shall be constantly monitored to ensure a safe and productive work environment. The following shall be complied at all times:

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- Emergency exits, stairway, roadways, walkways and fire points must be identified and kept free of obstruction
- Place of work shall be kept free from any obstruction and from any substance likely to cause a person to slip, trip or fall
- Equipment for use or installation placed on Location and work area shall not cause any obstruction unless otherwise approved
- Wires, cables, and gas hoses shall not be laid across floors, steps, stairs, passages, gangways and means of access.
- Construction materials shall be stored or placed at demarcated areas, and stacked in a safe, stable and orderly manner
- Cleaning of offices canteens, and sanitary facilities shall be carried out daily on e routine basis
- All waste shall be categorized and disposed to designated containers, bins, or designated places only.
- Construction and engineering waste and scraps shall be collected and place into designated bins at the end of the work day
- Surplus waste civil material such as soil, stone etc. must be dumped at the designated dumping areas or remove from Location
- Mass housekeeping exercise shall be carried out once every week, and as and when
- Contractors Project Managers or HSSE personnel deemed necessary
- Chemicals shall be stored in a designated area and locked to prevent unauthorized usage

6.38. Hazardous Substances

Any material or substances that are or may be considered hazardous to Personnel or the environment shall be handled, stored, transported, used or applied according to:

- Manufacturer's Recommendations
- Statutory Requirements
- Contractor shall keep a register of all chemicals used in the Project. Contractor HSE Manager shall approve all chemicals to be used in the Project before they brought into Project premises. It is advisable for the Contractor to generate an Internal Chemical Approval and Control Procedure

6.39. Portable Electrical Power Tools and Equipment

- Earth Leakage Circuit Breakers (ELCB) ere standard devices to be used on project locations. Contractors shall use ELCBs when using portable tools and/or equipment. This ensures the maximum safety and protection for all personnel.
- All their tools shall be tagged and tested.
- Double adaptors and piggy-back plugs shall not be used.
- Electrical extension leads and cables shall be, where practical, kept off the floors or ground and be secured at a height by insulated hangers that does not interfere with or hinder the work area.
- Electrical cords, as much as possible, shall not be coiled when in use, they shall be inspected daily before they are used
- Electrical extension leads across pedestrian access ways / floors shall be adequately protected from damage and to reduce trip hazards.
- All equipment shall be visually inspected by the operator prior to use and by a licensed electrician on a three-monthly basis with details of the inspection being recorded in the "Electrical Inspection Register" and on the appropriate colour coded tag for the period.

Common types of power tools used are:

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- Drills Rivet
- Grinders
- Guns
- Circular saws

6.40. Electrical work

- For all works that require the identification and control of electrical energy, an approved Log Out - Tag Out (LOTO) Procedure shall be utilized. Contractor shall ensure to generate and utilize a LOTO procedure to manage the intervention on electrical equipment. As minimum, this procedure shall include:
  - Selection and appointment of competent personnel
  - Roles and responsibilities
  - Training requirements
  - Approved tools
  - Safety devices and mechanisms
  - Communication protocols
  - Authorization protocols
  - Administration and physical controls
  - Precautionary measures
  - Maintenance and testing protocols
  - Consideration on simultaneous operations
- All pertinent personnel shall be trained, If energized equipment, installation, or electrical system must be intervened it shall be de energized and/or isolated prior to commencement of work on them by using the Log out Tag Out Procedure
- All practicable measures shall be taken to protect any person against the risk of electric shock arising from or in connection with the use of any electrical installation or equipment.
- Underground or concealed electrical power lines must be identified and marked prior to any work to be carried out onto the ground or wall.
- In work areas where the exact location of underground electric power lines is unknown, person using hand tools which may contact a line must be provided with insulated protective gloves and insulated protective footwear.
- All dangerous occurrences and electrical incidents shall be reported to the Contractors Project Manager and HSSE personnel immediately and followed by submission with an appropriate written report.
- Electrical installation and equipment shall be of good construction, sound material and free from defect.
- Electrical installation shall be performed, tested and checked by a Licensed Electrical person.
- Testing, inspection and maintenance on electrical installations shall be done by a licensed electrician.
- All temporary electrical in building and work location shall be provided with earth leakage circuit breakers (ELCB).
- All wiring shall be made of weatherproof types, properly insulated and provided with adequate mechanical protection.
- No bare wires or other unprotected conductors shall be located within 4 meters of any surface where employees may work or pass, unless completely guarded by a fence or other barrier.
- No person shall work in such proximity to any part of an electric power circuit that he may be in contact with in the course of his work unless he is protected against electric shock.
- Person shall be advised of the location of such lines, the hazards involved and the protective measures to be taken. No extension to the electrical wiring system shall be made without the Contractor Project Manager and HSE Manager approval.

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- Underground and/or concealed cables shall be identified on Location layout drawings and other related drawings, and shall also be Identified with markers on location.
- All electrical , testing or alterations to any electrical equipment shall only be undertaken by a suitably licensed electrician.
- All electrical equipment including cables, leads or extension cords are to be examined and tested at regular intervals. The findings of these inspections are to be recorded and action taken for the repair, replacement or destruction of the damaged equipment after suitable approval has been granted.
- Switchboards shall be kept locked at all times. The key shall be secured in a safe place to prevent unauthorized access.
- Mobile portable lighting shall be inspected daily for broken switches, exposed or damaged wiring, blown bulbs and damage to trailer and trailer frame. Portable items which are damaged are to be tagged and the details of the damage recorded and then action taken for the repair, replacement or destruction of the damaged equipment after suitable approval has been granted.
- Conductors, switchgear and electrical apparatus is always regarded as being alive until it is proved to be dead by means of approved test lamps, suitable indication devices or voltmeters.
- All electrical equipment and tools are to be inspected by a Licensed Electrician on a monthly basis.

6.41. Working on or near Exposed Live Circuits and Equipment

When working on exposed Live Low Voltage Mains and Apparatus adequate precautions must be taken, otherwise may result in injury or death,

- Insulating mats and hose are to be used by Construction staff when working on or adjacent to exposed Live Low Voltage Mains and Apparatus. When insulating mats and hose are used to cover conductors or earthed metal, the mats and/or hose must be securely fixed to prevent displacement. Conductors and apparatus taken out of service must be proven" dead h by testing
- Precautions must be taken to ensure that the supply remains de-energized by Locking Out the main control switch and any other control points which are capable of restoring supply.
- "Danger" Notices are to be securely attached to the operating lever or push buttons so there is no risk of them becoming dislodged, or of an operator being able to restore power or operate the equipment whilst being unaware of the danger by doing so

6.42. Isolations

Electrical Isolations shall be co-ordinated via Local Electrical Authority, appointed Responsible Competent Person, HSSE appointed personnel and respective Supervisor.

Contractors will adopt its internal Isolation and Lockout procedure.

6.43. Lock-out & Tag-out of Equipment

A lock-out and tag-out procedure shall be in place for machinery or equipment at the Location for the purpose of inspection, maintenance, routine servicing, or repair. During this period, if the machinery or equipment is inadvertently activated or energized leading to a start-up, it is liable to cause bodily injury to any person who may be working on the machinery, by the sudden release of energy.

The lock-out & tag-out procedure is a set of procedures established for the following purposes:

- To ensure that all energy sources to the relevant part of the machinery / equipment, shall be isolated or disconnected.
- To prevent any interconnected part of the machinery / equipment from being inadvertently activated or energized.
- To implement for the inspection, cleaning, repair or maintenance of any plant, machinery or equipment

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Note: The Contractor Log Out and Tag Out Procedure shall integrate all pertinent piping, mechanical, pre-commissioning, commissioning activities as well as communication and joint activities at battery limit form multiple contractors/service providers

6.44. Work Permit System

The intention of the permit to system is to control construction activities having the potential to result in personnel injury, property damage or environment impact.

Locations shall implement a Work Permit System to be applied during construction stage and communicate to contractors. The work permit system shall cover;

- Entry into confined spaces
- Work at Height
- Excavation
- Use of explosive devices
- Hot work
- Electrical work
- Radiography
- Piling work
- Demolition
- Lifting operations involving lifting machines and appliances
- Tunneling work
- Working at height where a person could fall more than 2 meters
- Any other high risk activities, as identified by risk assessment shall also be included It may extend into cold commissioning activities, which may require a Clearance Certificate.

6.45. Hot Work

"Hot Work" is any work activity which requires or involves open flames or any other sources of heat that could ignite flammable or com**bu**stible materials in the work area. Such work shall include but not be limited to, welding, burning, grinding, soldering etc. The following requirements shall be in place prior to commencing any hot work activity.

- A work permit system shell be implemented for hot work activities o An adequate number of dry powder fire extinguishers shall be located within close proximity to hot work areas
- A trained fire watchman shall be assigned to be positioned at the area where hot work is being carried out
- All Slags and sparks shall be contained within the work area. Fire blankets shall be used to contain the sparks, if required.

No hot work close to operating plant and in commissioning areas shall be done by Contractors without BPCL permission.

6.46. Welding

- Welding works shall comply with Indian Standard requirements. Only competent and authorized workers use welding and cutting equipment. Welders and fire watchers shall be competent in the operation of fire extinguishers, fire hoses and any other fighting equipment.
- No Welding and gas cutting close to operating plant and in commissioning areas shall be done by contractors without BPCL permission.
- Fumes and gases evolved shall be identified and exposure controlled. Welders and other persons in the vicinity shall be protected against exposure to ultra violet light and infra-red radiation emitted from the welding operation.
- Welding sets shall be in good condition, properly maintained and earthed.

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- Terminals and live components shall be adequately protected.
- Cables shall be inspected to ensure the insulation is intact.
- Damaged cables or electrical holders shall be properly repaired or replaced
- Welders shall wear face mask, appropriate face shields and welder gauntlets during welding activities
- Only competent and authorized workers shall use welding equipment.
- Precautions shall be taken against exposure for welder and other personnel to ultraviolet radiation, fire, explosion, asphyxiation, or exposure to toxic gases, fumes or dust during welding activity.
- Adequate ventilation shall be furnished when working with welding equipment.
- Fire extinguisher/charged hoses/firefighting equipment must be provided at the welding work locations.
- Welders and fire watch personnel shall be competent in using the fire extinguisher/fire hoses/fire fighting equipment.
- Welding shields must be used to protect the eyes of nearby workers and visitors from ultraviolet exposure.
- Welders shall not wear metal rings, bracelets or necklaces during work as these might be heated by induced currents from the welding equipment.
- The welding equipment shall be checked for defects by the welder prior to usage:
- Damaged insulation on welding leads electrode holders and connections;
  - Faulty earth clamps and earth leads,
  - Torn insulation mats/cradles;
  - Worn or damaged hoses;
- Welding equipment shall be installed in such a manner that it can be continuously seen by the welder during welding activities.
- The welding equipment shall be placed at ground level only. The welding equipment shall not be placed in the path of falling sparks or in elevated structures.
- Diesel welding machines, generators and transformers must be protected by suitable covers for general protection.
- Such equipment must be turned off when not in use.
- Welding machines shall be inspected by a licensed electrician on a monthly basis
- Metal frames and casings of mains powered welding rectifiers, transformers and voltage regulators shall be earthed.
- Welding leads and return leads shall be well protected against mechanical damage.
- The earthing cable shall be attached to the work area as close as possible.
- The earthing cable shall not be attached to an existing installation or apparatus.
- Welding of the earthing cable is prohibited. No concrete reinforcing steel bar shall be used as earth point.
- The work piece shall be positively earthed, using a well-protected earthing wire connected at both ends by bolted lugs or secured by screwed clamps.
- Grounding to plant equipment pieces is prohibited.

6.47. Gas cutting

- Gas cutting shall comply with Indian Standard requirements.
- Gas cylinders shall be in good condition and free from corrosion
- Gas cylinders shall be properly colour-coded and individually identified
- Hoses shall be properly colour-coded to the internationally recognized standard for the gas being used, in good condition and fitted with hose connectors attached with permanent clips. Jubilee clips shall not be used

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- A suitable non-return valve or any other similar device which prevents the backflow of gas shall be fitted in accordance with the manufacturer's instructions between each gas torch inlet and gas hose of every oxygen-fuel gas equipment.
- A flashback arrestor which stops flashbacks shall be fitted in accordance with the manufacturer's instructions at the pressure regulator outlet of each gas cylinder
- Gas cutting equipment must be inspected on a daily basis for leaks, damaged hoses, regulators and pressure gauges, etc, Defects must be reported.
- Suspected leaks may be confirmed with a soap solution. Equipment must be replaced if leak cannot be repaired
- There shall be a designated area for proper storage of cylinders. Cylinders shall not be left lying around, They must not be stored or used in a horizontal position, but must be secured in an upright position, Cylinders must not be taken into confined spaces for use or storage, and shall not be placed on scaffolds
- Cylinder storage area shall be well ventilated and away from heat source or direct sunlight, "No Naked Flame", II NO Smoking" and "Flammable" sign boards shall be displayed
- Cylinders must be handled with care and must not be misused. They must be properly shut off when not in use and safety cap must be fitted when being moved
- Cylinders must be placed in a cylinder cage or frame prior to lifting by crane. Manual lifting of cylinder should be minimized. Cylinders shall not be subjected to drop, knocks, and roll during handling
- Cylinders must be placed in trolleys. A bottle key shall be kept with cylinders in use. Cylinders not in use shall be fitted with a safety cap.
- Oxygen and fuel gas cylinders shall be kept separate with a minimum distance of 5m. Empty cylinders must be separated with full cylinders, and shall be marked "Empty" or 'Full"
- Gas cutting equipment, including hoses shall not cause obstruction. Hoses not in use must be coiled up and put in a safe place. Hoses should be supported off the ground
- Gas cutting equipment, including hoses must be removed from confined spaces and excavations during any break or at the end of the day

6.48. Hazardous Areas

- Hot work shall not be carried out in a hazardous area unless a hot work permit is issued.
- Before hot work in a hazardous area is performed, the Contractor and person(s) performing the hot work shall:
    - Provide suitable locations for equipment including emergency fire fighting equipment.
    - Consider any possible changes in circumstances during the hot work, which may render the area unsafe..
    - Ensure fire watchman and fire fighting equipment are available.
    - If required, fire blankets will be used to protect areas that could com**bu**st due to sparks
    - Issue hot work permit.
    - Ensure that when hot work is performed, welders will not work alone and shall be provided with assistance as considered necessary. One of the duties performed by the assistance shall be of trained fire watcher.
    - Ensure that on completion of the hot work, the permit has been signed off by the issuing officer.

6.49. Confined Spaces

All conditions, precautions, etc. as outlined in the Regulations and relevant code of practice shall be adhered to. In addition, the requirements as defined in Additional requirements are as follows:

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- A competent Confined Space Assessor shall be engaged to closely monitor and supervise the safe work operations in the confined space. He shall be the assessor of the confined space where works are intended to be carried out
- The Confined Space Assessor shall test the atmosphere of a confined space prior to entry by any person into the confined space. The results, indicating the levels of oxygen content, flammable and toxic gases shall be recorded and attached to the work permit system.
- A copy of the approved work permit system shall be displayed at the entrance of the confined space.
- Atmospheric testing of the confined space shall be carried out prior to start of confined space works and subsequently at 6-hourly intervals if the work is continuous. The work permit system will be revoked if independent testing shows the confined space to be an unsafe hazardous environment Re-entry into the confined space shall only be allowed with the issuance of a new PTW
- Confined Space workers (entrants) shall have passed the BPCL approved Safety Orientation
- Confined space attendant(s) who have to communicate regularly with the entrants shall be trained in the same areas as the entrants He shall also be trained in rescue efforts so that he can coordinate rescue efforts in times of emergency. The attendant shall not leave his position at the outside entrance of the confined space at any time.
- Forced ventilation shall be provided at all times to a confined space when work activity is being carried out. The ventilation system would consist of a blower connected to flexible ducting. Only explosion proof blower shall be used for combustible atmospheres. The requirement and determination of equipment to be used and its set up while obey a Contractor Confined Space Assessor ventilation plan.
- Appropriate respiratory, breathing apparatus and proper PPE shall be provided to protect the entrants from inhaling contaminants in the confined space
- A retrieval system consisting of a retrieval line, body harness and a lifting device, or other suitable means shall be used by entrants who are authorized to enter into a confined space and tended at all times by the attendant.
- Illumination of not less than 50 lux shall be provided for access and passage into the confined space.
- All portable hand-held lightings provided in confined space shall be operated at an AC voltage not exceeding 55 volts between the conductor and earth or DC voltage not exceeding 1 10 volts
- Warning signs shall be displayed at or near every access point to warn persons of the existence of a confined space.
- A confined space entrant shall always wear a safety harness with a retractable lifeline, abrasion resistant gloves, protective non-slip footwear and safety helmets.
- A tripod or crane should be used to lower workers where possible.
- Breathable air cylinders to be used shall be properly certified and tested before each use
- If Air compressor will be used to supply breathable air, the compressor shall be for that purpose only and it should be provided with CO, moisture, temperature and oil in line monitor and deficiency alarms.

6.50. Excavation

Contractor shall authorize all excavation work by means of an excavation permit; it includes on-shore pile driving and soil testing. Proper checks, e.g. by hand excavated test holes, shell be made for the presence of underground cables or services before machine excavation work is authorized. Drawing checks are insufficient. On project locations within or adjacent to operating plants , all machine excavation shall be done with a dedicated and properly trained banksmen observing the actual soil cutting and removal. The following conditions shall be in place for excavation works:

- Excavations shall be barricaded with signs and shall have warning lights at night

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- Excavations with a depth of more than 1.5 meters must be shored, sheet piled or sloped. Excavation more than 1.5 meters depth must have a barrier constructed from the edge of the excavation
- Materials shall be placed more than 1.5 meters away to prevent collapse. Vehicles shall not be parked near excavation areas • Exposed cables or services shall be supported
- Exits points shall be provided
- Excavations shall be inspected by the supervisor daily before work start. Any shoring for excavation depth exceeding 4 metres shall be designed by a professional engineer
- Excavations and trenches more than 1.2 meters depth shall be considered as a confined space and subject to work permit control, both on existing operating and green field project locations
- A designated person who has completed adequate training in safety and health shall supervise the excavation works. He shall also carry out daily inspection of the excavated area before commencement of work, and after every rainstorm or other hazard occurrence
- Access ladders must be provided for excavation depth exceeding 1.2 meters and at least every 25 meters around the perimeter of all excavations
- Ground water must be pumped and kept out from the bottom of all excavations
- Gas cylinders must not permitted in any excavation
- Edge line of excavation, ropes, chains and other tripping hazards must be marked in order to be clearly visible during day or night
- Starter bars or other protruding objects must be covered or removed
- Personnel removing shoring after completion of work must not be at the bottom of the excavation
- Only a trained and competent excavator operator is allowed to operate the excavator. The excavator operator shall have completed a training course on the operation of excavators
- Excavation machinery must be positioned and operated in a manner that will not endanger any person involved in the excavation works
- No person shall be permitted to work or to be at vicinity where he may be struck or endangered by excavation machinery or by material dislodged by it or falling from it. A safe distance must be maintained between the excavator machine and any person(s) working near to that machine. Person(s) must be prevented from entering the safe operational envelope of the machine; if no-one is there than no-one can get injured.
- visible barrier shall be erected around the excavator to prevent person(s) from walking close to its operating envelope
- Excavations must be gas checked before any personnel enter if evidence of gaseous elements is suspected
- Excavators shall not be used for lifting purposes at any time
- Excavation machinery shall be subjected to daily inspection and regular maintenance

6.51. Security

Contractor shall include the provision of full-time security personnel to manage Security measures at the Location. These personnel form part of the Emergency Response Team (ERT) and assist in emergency evacuation of personnel. The security department shall take the following measures daily.

- Attendance record for all Location personnel including sub-contractors and visitors
- Issuing of visitor pass as per location procedure
- Vehicle movement record for all vehicles entering and leaving the Location
- Records for all incoming and outgoing machineries such as cranes, excavators, piling rigs, etc,
- Stop and conduct checks on all persons, their identities, and any items in their possessions, custody or control
- Declaration form by persons carrying personal phones, pagers, walkie-talkies
- Control and management of unauthorized parking at Location premises

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- Location patrol
- Support the Contractor Drug & Alcohol Monitoring and testing Procedure
- Support Contractor Management in handling cases of workers involved in misconduct /violations at the project location.

6.52. Location traffic & Transport of Material

Contractors shall ensure the following conditions are in place for transportation of materials:

- All vehicles must be roadworthy and conform to local legal requirements.
- Inspection and maintenance of all vehicles and construction equipment before mobilization on Location. Periodic maintenance to be conducted after mobilization on-Location. All vehicles must be wellmaintained, and exhaust emissions must be clean, with no visible black smoke. All safety features/devices shall be fully operative at all times.
- Risk assessment on the 'transport of materials to include as a minimum: loading, securing, unloading of materials, escorting heavy loads, escorting loads in complicated/congested routes, use of banksmen and spotters as needed, peak hour mobilizations, pre-checks of heavy loads routes and areas impacted by inclement weather.
- Training and authorization of drivers of all classes of vehicles and construction equipment. Contractors must ensure that only licensed and authorised personnel are allowed to drive
- Designating Location personnel to act as traffic controllers. Traffic controllers to be briefed on roles and responsibilities.
- Demarcation of areas on-Location where traffic is allowed to be made known to all Location personnel and visitors. Contractors must erect barricades and install signs to separate pedestrians from vehicles. Particular attention must be paid at entrances to the Location.
- Reverse sensors to be fitted on all vehicles where practicable. In the event where fitting of the sensors are impractical, traffic controllers should be deployed.
- Seat belts are compulsory for the drivers and passengers of all classes of vehicles.
- Vehicles must be parked at a designated car park and shall not block access or emergency points
- Traffic management will be coordinated through the BPCL project manager.
- Only authorised routes must be used to and from the Location- Mobilization route drawings must be communicated and update accordingly.

6.53. Piling

Contractor shall carry out Piling operations shall be carried out, as a minimum, in accordance with the following requirements:

- Method statements risk assessments and emergency procedure for piling works
- Structure adequately supported by sheet piling or other means of shoring in accordance with the design of a professional engineer (PE)
- Contractors shall assign an area for pile preparation at a safe distance away from the piling zone
- To determine the piling machine's safe working area/access on Location during operation/movement based on type of machine operated and the ground load bearing capacity e Provision of suitable PPE to protect rig operators and workers from falling objects, noise, etc, Inspection of the piling machine daily prior to start work. Ensure all safety mechanism/devices are well known by involved personnel and are in good working condition
- Submit the Work Permit for piling prior to work commencement and proceed work subject to approval from the Project Manager
- Suitable footing such as steel plate and hard core to be provided if piling rig is to be driven on soft ground
- Only trained and competent persons to operate piling machines With valid LM certificates
- Bored holes to be properly barricaded and/or effectively covered.

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- The piling machine shall be subjected to regular inspection and maintenance regime programme. It shall have updated and valid certification.

6.54. Demolition

Contractor shall perform demolition work in accordance with the following requirements:

- Method statements and risk assessments for demolition work shall include exposure to hazardous chemicals such as dust and toxic chemicals
- De-energize all electrical supply prior to commencement of demolition works
- Protection of adjacent structures against premature collapse
- Disposal of all types of waste in accordance to local authority requirements
- Demarcation for no-entry zones to prevent unauthorized entry into the structure being demolished.
- Appropriate PPE requirements such as safety harnesses, anchoring points, respirators, etc.

6.55. Commissioning

It is vital to mobilize commissioning managers and other key persons early, and to maintain continuity of people, planning and work processes from construction through cold commissioning to hot commissioning to start-up. Cold commissioning involves cleaning and functional testing of utility and process systems without the introduction of nitrogen and hydrocarbons. Hot commissioning involves introduction of hydrocarbons or other process materials for testing purposes and the functional testing of all remaining utility and process systems. During commissioning, BPCL work permit system will be used.

6.56. Environmental Management

BPCL Project team should audit the implementation of adequate environmental protection plan, procedures, protocols and actions.

Environmental management shall include the following.

- Waste management
- Chemicals management
    - Fugitive dust controls
- Noise and vibration controls
- Traffic management ensuring "clean wheel policy"
- Reinstatement of land after temporary works
- Vector controls (e.g. by dewatering, water treatment, use of water-based spraying of mosquitoes instead of thermal fogging, others)
- Rodent and pest controls
  Hygiene controls of office f and warehouse facilities and canteens
- Waste and spoil management to include hazardous waste (e.g. keeping a list of hazardous substances used and SDS, keeping a list and utilizing approved waste collectors, implementing programs to minimize waste by programme for recycling, reusing and recovering, others)Reporting of environmental incidents
- Training on environmental principles end procedures
- Effluent discharge controls
- Pollution prevention training
- Complying with all Pollution Control Board requirements
- Taking timely and adequate actions to resolve any potential audit observation

6.57. Waste Management

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All Contractors shall take provision for proper disposal of general and industrial waste at the Location. Collection of garbage and industrial waste should be conducted on a regular basis. Waste should be segregated based on the different types such as metal, wood, food, hazardous and general waste. General guidelines on disposal of waste should include the following.

Hazardous waste to be disposed in separate containers and clearly labelled. Contractors should engage a licensed industrial waste collector to dispose all hazardous waste. Hazardous waste includes waste generated from clinics such as

- Signs are to be placed at designated areas for the storage of waste bins or containers
- Batteries should be segregated and subsequently disposed in a safe and controlled manner
- Only approved contractors should be engaged for the recycling of scrap metal.
- Chemical containers and drums should be reused if still in good condition
- Disposal of garbage shall meet local legislative requirements and public health standards. Solid waste management shall be managed by the collection of refuse by licensed general waste collectors
- There shall not be any overloading or spillage of construction wastes from skips
- Refuse bins shall be properly covered
- Organic food wastes and construction wastes must not be stored together and shall be removed daily
- Waste/used oil shall be properly collected and sent to a pollution control board licensed collector/agency.
- dressings, swabs, used syringes, needles, cartridges, medicines, tablet and other chemical waste used in OHS centre.

6.58. Air Pollution Control by Contractors

- Lorries and vehicles carrying construction materials must be properly and adequately covered
- There shall not be any emission of dark smoke from construction equipment and machinery
- Open burning of construction waste is strictly prohibited.
- Dust preventive measures such as water sprinklers/spray, shielding, netting, covers/hoarding for aggregate/sand stores shall be provided and maintained.

6.59. Noise Pollution Control by Contractors

- DG sets at Location shall be with acoustic enclosure.
- Regular maintenance shall be carried out for all equipment and machinery to prevent excessive noise emission
- Noise monitoring activities may be needed/required on particular cases.

6.60. Toilet & Washing facilities by Contractors

Sufficient toilet and washing facilities at the Location office shall include the following facilities:

- Wash basins and showers shall be provided with hot and cold water, with soap and paper towels, continuous roller type towels or hand dryers
- Continuous supply of water should be provided at all times
- Toilet and washing facilities shall be kept clean and in working order
- Floors, walls, ceilings and fittings in the facilities should be of a finish that can be cleaned easily
- Waste water should be connected to a disposal drain and discharged to a drain

6.61. Canteen& Food Hygiene

Contractors shall maintain a high level of food hygiene at the Location. The necessary steps are to be taken to prevent food contamination that may lead to case(s) of food poisoning:

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- Provision of a designated area for consumption of food away from the Location.
- All Location personnel are to be briefed on good hygiene habits prior to consumption of food.
- Consumption of food at any other area other than the designated area should be strictly prohibited.
- Only food catering operators that are licensed are allowed to deliver food to the Location.
- Food handlers shall wear gloves or use tongs or other suitable implements when handling ready-to-eat or cooked food

6.62. Drinking Water

Contractors shall ensure the availability of sufficient potable drinking water for all personnel at the Location. Drinking water standards should meet WHO quality standards. Provision of potable drinking water and water stations shall also meet the following requirements:

- The stations for the drinking water and potable water tanks are to be labeled "Drinking Water" to differentiate from water used for industrial purposes
- Drinking water stations are to be indicated on the general Location layout plan to inform all personnel.

6.63. Lighting

Contractors shall provide sufficient and suitable lighting at every part of the Location as well as in the office. The requirements shall conform to the requirements stated in National building Code/OISD codes.

- General lighting requirements shall be as follows:
- Minimum 50 lux — for passageways, corridors and stairways
- Minimum 100 lux — for store rooms, toilets and wash rooms
- Minimum 200 lux -- moderate discrimination of detail required (eg. rough bench and machine work)
- Minimum 300 lux - close discrimination of detail required (eg. medium bench and machine work)
- Emergency lighting shall also be provided in the event of a power failure affecting the general lighting.

6.64. Health Monitoring

Health surveillance will be provided for staff where there is a legislative requirement or for staff who have been identified as having exposure to hazardous substances and the exposure to the hazardous substance is such that it is likely that an adverse effect on the staff's health may occur under the particular conditions of the work.

6.65. Procedures, Records Storage

BPCL HSSE procedures will be used as reference for Contractors compliance during the Construction Stage. Stringent of the two shall be complied with. Contractors Procedures will be aligned with BPCL Procedures. BPCL HSSE procedures will be fully in use during the commissioning stage,

Contractors shall ensure that the following records are obtained and kept on file:

- Insurance details for each contractor including Workers Compensation and Public Liability;
- Licenses and Permits
- Drivers license (motor vehicle and plant);
- Electrical contractors license;
- Crane drivers, signalmen, riggers, etc;

Contractors shall ensure that as a minimum the following documentation is maintained on the project:

- Details of HSSE training (external & In-house) and induction records, attendance records;
- Hot Work Permits and Confined Space permits; •Records of all accidents and near misses;

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- Details of all inspections, hazard/risk assessments;
- Copies of all Health & Safety reports

6.66. Emergency Response Plan (ERP)

Location shall develop and implement a comprehensive Emergency Response Plan to be used during the construction and commissioning phase. Communication with external authorities and Emergency Response Organizations shall be clearly defined.

A copy of the up-to-date Emergency Preparedness and Response Plan for each Area shall be made available as guide of the Emergency Response Team (ERT).

Specific high risk activities that require potentially complex rescues e.g. Confined Space within confined space or confined space requiring ventilation entry into a vessel loaded with trays or activities conduct from particularly high structures, such as flares, will be requires to have "Stand By" rescue personnel.

Locations shall ensure that contractors properly communicate the Emergency Respond Plan to their all personnel. Contractors will be responsible to ensure safety of all their supplier and short term service personnel and escort them at all time on Location.

All visitors and personnel entering the work Location shall be provided with instructions in what action to take in the event of a potential emergency situation. Key subject areas will be.

- Locations of medical facilities
- Overview of emergency plan and procedures
- Potential emergency threats on project
- Action to take in the event of an emergency
- Emergency notification alarms and their location
- Location of " Assembly Area"
- Action to be taken at a " Assembly Area"
- Medical Emergency response requirements
- First aid requirements
- Emergency Telephone numbers

6.67. Emergency Alarm System

Locations shall evaluate the need to install alarm systems. This could consist of the following.

- Gas Detection Alarm Systems
- Office Building Alarm System

6.68. Medical Facilities

Location shall maintain an OHS centre, equipped ambulance and first aid boxes at project Location as per the Building and Construction Workers Rules as applicable . Any project location more than 500 workers shall have one fully equipped ambulance van.

6.69. Incidents and Near Misses Reporting and Investigation

All accidents and dangerous occurrences shall be reported/ recorded as per BPCL IRIS system, regardless of whether or not personnel injury occurs.

- Fatal accident
- Lost Time Injury accident
- Dangerous occurrence
- Any incident involving a member of the public
- Near Misses

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BPCL shall conduct in-depth investigations into all fatal accidents, Lost Time injury, accidents, incidents involving a member of the public, dangerous occurrences. Copies of these investigations shall be forwarded to the contractor Representative.

6.70. Dangerous occurrence Reporting

- Bursting of a revolving vessel, wheel, and grindstone or grinding wheel moved by mechanical power.
- Collapse or failure of a crane, derrick, winch or other appliance used in raising or lowering persons or goods or any part thereof (except the breakage of chain or rope slings), or the overturning of the crane;
- Explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant, resulting in the complete suspension of ordinary work.
- Electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire, causing structural damage involving its stoppage or disuse.
- Explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (including air) or any liquid or solid resulting from the compression of gas.
- Collapse in whole or part from any cause whatsoever of any roof, wall, floor, structure or foundation forming part of the construction Location in which persons are employed.
- Total or partial collapse of any overburden, face tip or embankment on the construction Location.
- The overturning of, or collision with any object by any bulldozer, dumper, excavator, grader, lorry or shovel loader, or any mobile machine used for the handling of any substance on the construction Location.

6.71. Reporting of Fires to BPCL

The contractor shall report to the BPCL Representative all fires which occur on Location including any fires that have been extinguished by the contractor, and the Employers Representative may send staff to investigate such fires. The following information shall be provided:

- Time of fire;
- Location of fire;
- Means of extinguishing fire;
- Injury to any person / damage to any property; and
- The probable cause of fire.

6.72. Monthly Safety Submittal to the BPCL

The contractor shall submit following monthly reports to BPCL (but not limited to)

- Monthly report of total number of workmen.
- Total Man hours worked
- Number of LTI incidents
- Minutes of Location safety committee Meeting.
- Safety Inspection report
- Electrical Inspection Report
- Scaffold Inspection Report
- Crane Inspection Report
- Any potential concern

6.73. Safety Record to be maintained by contractor

The contractor shall submit following monthly reports to BPCL (but not limited to)

- Accident / Incident / Dangerous Occurrence report form.

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- Accident Statistic – Monthly report form.
- Contractors Monthly Safety report.
- Work permit records
- Risk Assessment worksheet.
- Safety Training Attendance record.
- Weekly Fire Fighting Equipment checklist.
- Electrical Inspection Report
- Scaffold Inspection Report
- Crane Inspection Report

6.74. Safety Inspections

Contractor shall establish following schedule of inspections as a minimum at each project Location and submit inspection checklist

Inspection Category	Inspection Type	Periodicity
Planned General Inspection	Contractor and subcontractor Location safety committee	Monthly
	Daily safety inspection by contractor Location safety Team	Daily
Routine Inspection	Inspection of equipment	Daily
Special inspection	As per equipment manufacturer's manual (scaffold, crane, HEMM, Electrical etc.)	----

6.75. Safety Recognition

Locations shall develop and implement recognition scheme to recognize outstanding safety performance of workers, supervisors and subcontractors. This recognition shall l be given out on a monthly basis.

BU/ Locations may award contractors who have performed well in best safety practices and achieved "Zero harm to People and Assets Incident" target.

7.0 Review

Corporate HSSE shall review this technical standard once in 2 years and need based in consultation with BU HSSE Role Holders.

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8.0 Definitions

Project	A project, by definition, is a temporary activity with a starting date, scope, specific goals and conditions, defined responsibilities, a budget, a planning, fixed end date, parties involved. It means here a EPC project related to construction and commissioning of a new installation at a new Location or expansion / modernization of existing installation at the existing Location. The project work activities may include but not limited to activities related to Construction, Erection, Modifications, Expansions, Maintenance, Demolishing, etc.
Project Safety Management Plan	A comprehensive document defining entire safety management system for the proposed activities. This shall be submitted by contractors in BU prescribed template and shall be approved by project owner/his representative prior to start of the work.
Project Locations	It includes A. New projects such as greenfield Locations as well as B. Projects within or adjacent to existing installation/plant (but separated by a fence with an independent access control. In case of project work , within or adjacent to existing installation/plan , prior work permit shall be required.

9.0 Abbreviations

API	American Petroleum Institute
ANSI	American National Standard Institute
ALARP	As Low As Reasonably Practicable
BPCL	Bharat Petroleum Corporation Limited
BU	Business Unit
EPC	Eraction, Procurement and Commissioning
FEED	Front-End Engineering Design
HSSE	Health, Safety, Security , Environment
HAZOP	Hazard and Operability Analysis
HIRA	Hazard Identification and Risk Assessment
IRIS	Incident Reporting and Investigation System
ISO	International Organization for Standardization
IS	Indian Standards
JSP	Job Safety Plan
OISD	Oil Industry Safety Directorate

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RLTIFR	Reportable Lost Time Injury Frequency Rate
OHSA	Occupational Health and Safety
P & ID	Piping & Instrument Diagram
PSP	Project Safety Plan
QRA	Quantitative Risk Assessment
SWP	Safe Work Procedure / Standard Operation Procedure
TS	Technical Standard
WPS	Work permit system

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Appendix 1 : Project Personnel Responsibilities

BPCL Project Leader : Specific Responsibilities may include:

- Ensure Project Safety Management Plan is developed and implemented for the project and actively promote safety via personal example and supervision.
- Ensure the allocation of adequate resources for implementation of the Project Safety Management Plan
- Promote the reporting of all incidents (including non-injury) by all employees
- Ensure an audit plan is in place to monitor the compliance and effectiveness of the Project Safety Management Plan
- Endorsement of the BPCL HSSE Policy

BPCL Project Engineers

Specific Responsibilities may include.

- Ensure the effective communication of the Project Safety Management Plan to all employees, Contractors and its subcontractors
- Ensure the Project Safety Management plan as documented is implemented and to actively promote via personal example and supervision
- Familiarization and compliance of legislation as applied to the project
- To ensure safety training and induction programme are formulated and exercised to all employees, Contractors and its subcontractors
- Promote a recognition Scheme for personnel and Contractors with outstanding safety performance
- Promote a safety accountability scheme to deal with personnel with under expectation safety performance
- Promote the reporting of all incidents (including non-injury) by all employees.
- Ensure that the Contractors and their subcontractors have undertaken their Health and Safety obligations
- Undergo necessary safety training and induction of each construction Location

BPCL Project HSSE Role Holders

- Daily job planning with contractors job representatives
- Audit / inspection the implementation of the BPCL Location Project Safety Management Plan as defined herein.
- Liaison with Contractors' safety personnel and line managers.
- Audit Contractor Line Management implementation of the Project Safety Management Plan
- Participate inspections of the work areas with Contractors Management
- Advise supervisory staff and employees in the implementation of strategies to identify and control potential hazards.
- Liaise with Contractor's Safety Role Holders to request to the Contractors action plans for safety performance improvement as needed
- Audit Contractors equipment and machinery inspection process
- Audit Contractors' Hazardous Materials storage and controls
- Conduct internal safety training

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- Participate in safety meetings, including the Project Safety Committee Meetings
- Incident recordings and investigations
- Safety discipline

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Appendix 2: Sample Template for Project Safety Management Plan

Project Details:

CLIENT/COMPANY	
PROJECT	

Prepared by:

Reviwed by:

Approved by:

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	Authorized Person Submitting safety Plan & Contact details	
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7.2	Contractor's Alcohol & Drug Policy	
7.3	Safety Objectives & Targets	
8	Contractor's safety Organization • Safety Committee • Project Director • Location Manager • Supervisor	

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	• Location Safety Head • Location SAFETY Managers • Location SAFETY Representatives • SAFETY Stewarts • Labor Welfare officer • Medical Officer & staff • Sub-contractors • Fire / Safety Watch • Quality Assurance Staff	
9	Hazard Identification , Risk assessment & Risk mitigation Procedure	
10	Facility & Equipment provided to safety personnel	
12	Selection , Control & evaluation of Sub contractor	
13	Issuing I Card & Maintaining Register of workman	
14	Health Surveillance & Facilities (Occupational Health center , Ambulance & First aid facilities)	
15	Contractor's Safety committee meetings	
16	Safety Department & Contractors Safety stewards meetings	
17	Pre start up meeting	
18	List of Safe Work Procedure to be maintained at Location	
19	Hazard Reporting & Rectification Procedure	
20	Work Permit Systems	
21	Lockout & Tag out followed, if yes details	
22	Details of Persons Having "Certificate of Competency" on high risk activities including: • Work permit issuer • Electrical work • Operators- Crane, Hydra / Derrick • Drivers • Slinging & Rigging • Scaffold • Any other Note : Provide copies of certificates of competent persons	
23	a. Contractor's Safety Training , Promotion & Recognition b. Induction Training to project managers / officers/ supervisors (Prior to start the work) c. Induction Training to contractors (Prior to start the work) d. Training plan and agenda e. Competency assessment training f. Safety Internal auditor training g. Mandatory Safety Training to selected employees/	

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	workmen (Firefighting / First aid / Emergency drill) h. Safety Intranet i. Quarterly Safety Campaign j. Safety Signage k. List of Days to be celebrated l. Safety Rewards	
24	**Contractor's Safety Inspection System** a. Management Walk b. Daily Safety inspection by SAFETY Representative c. Daily Safety Inspection by contractor Safety Officer d. Scaffolding & Platform inspection (weekly) e. Lifting machines / tools inspection by Competent Authority –Annually f. Lifting appliances (Quarterly) – Inspection & color coding g. Electrical safety inspection – Monthly h. Heavy Earth moving machineries	
25	**Contractor's Safety Consultation & Communication Arrangements**	
26	Monthly Performance Reporting parameters to THDCL	
27	Monthly Reporting by Sub Contractors and designated person	
28	**Contractor's System of Safety Audit** • Internal Safety Audit • Corporate Safety Audit • Third Party Audit • Special Audit – Electrical, PTW, Fire Safety etc.	
29	Fire Protection Plan & Facilities	
30	Work Place Monitoring	
31	Incident / Accident Management • Reporting • Investigation • Control measures follow up • Statistics	
32	List of standard IS approved PPEs provided at location	
33	Road & Traffic Management	
34	Details of Labor Health & Welfare Camp & facilities to be provided	
35	Environmental Management • Disposal of construction waste • Hazardous / Inflammable chemicals management • Hazardous waste management	

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	• Dust Suppression • Emissions – DG Sets • Waste Water Management – Sewage • Drinking Water Management • Illumination Management • Noise Management • Vector Control Measures	
36	Visitors and Security Management	
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38	Abbreviations & Definitions	

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Appendix 3: Contractors Roles & Responsibilities

Contractor's Project Manager

The contractor's Manager has overall responsibility for the development and implementation of appropriate Location Managing and Health and Safety Standards of BPCL. He shall also keep all team members of their responsibilities, current, new and amended statutory requirements.

The contractor's representative shall inform the name of Location Manager to BPCL at least 3 weeks prior to commencement of work. He shall work closely with BPCL Project manager and BPCL Location Safety officer.

Contractor's Managers/ Supervisors

All managers / supervisors employed by the contractor shall conform to the following requirements:

i. The understanding and acceptance of their responsibilities under the BPCL health and Safety Policies and current Indian Health and Safety Legislation.

ii. Make themselves fully conversant with the contents of this document copy and operate within all legal and BPCL requirements applicable to the project location. This requires the continual and regular checking of these requirements in actual practice and taking any necessary corrective action.

iii. Ensuring that all newly engaged or transferred personnel under their control are made fully aware of any known hazards or processes within the project location and the preventative measures to be taken or provided to reduce the risk to personnel.

iv. Ensuring that all employees, including Supervisors, are properly trained for the specific tasks allotted to them. That all newly engaged and transferred employees receive the Health and Safety induction training prior to commencing work at the project location, and that they receive on the job training in health and Safety matters.

v. Ensuring that all personnel under their control are made fully aware of the emergency and evacuation procedures and that the locations of firefighting equipment, alarms, emergency doors and exit routes and assembly areas are pointed out to them.

vi. Making sure that all plant, tools and equipment at the location are maintained in a condition that is safe to use, that all the necessary Safety equipment is readily available, issued, used and maintained and that there is a safe means of access and egress to and from the work location at all times.

vii. Ensuring that the entire relevant safe operating procedures and systems of work instructions are generated, made known to all respective personnel and strictly adhered to. This includes the continual review of these procedures and instructions in practice and discussions with the employees concerned to ensure that they are workable and understood.

viii. Ensuring that all personnel under their control are adequately trained and capable of carrying out their duties correctly and safely, and that no newly engaged or transferred employees are required to undertake any task without the appropriate training, instruction and supervision.

ix. Knowing and thoroughly implementing the accident and incident reporting investigation procedure and taking prompt remedial action to prevent recurrences.

x. Assisting BPCL on investigations, complying with instructions given by him, and co-operating on areas recommended for improvement.

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xi. Demonstrating a personal interest in the health, Safety and welfare of personnel, applying a good standard of housekeeping within the work location and encouraging a positive response from other personnel by showing a high standard of self-discipline in respect of health and Safety.

xii. Maintaining a high standard of health and Safety at project location by the day to day Safety training, no matter how small the requirement, by individual instructions, as necessary.

xiii. Assisting the BPCL Representative on work location inspections and taking action any recommendations made, provided they are able to do so. Ensuring that in the event that any matter raised be unresolved, even with the facilities available to them, they refer the issue to the location Incharge/ Head.

xiv. Where new plant, equipment, process or changes are to be implemented within the work area, they are to make BPCL Representative(s) aware of the details and the potential effect such plant / equipment / practices are likely to have on the health and Safety of personnel in the work area.

xv. Seek the advice of the Location Incharge on matters of health and Safety, protective equipment, clothing, systems of work and procedures wherever any doubt exists.

xvi. Determine the requirements for protective equipment or clothing for operations and processes and requisition the same from stores and issue same to those requiring use of such equipment.

xvii. Notify their immediate superior of any defective, damaged or missing guards on machinery or plant and request that the matter be dealt with immediately prior to permitting the use of any such plant or machinery, etc.

xviii. Notifying the Location Incharge of all personnel whom they intend to employ on operations involving contact with hazardous process.

xix. The contractor's managers/ supervisors have an overall responsibility to ensure that all machinery, plant and equipment under their direct control are safe and without risk to employees.

xx. In the event of the contractor's managers/ supervisors not being able to resolve a health and Safety problem, especially ones reported to him by employees, he shall refer the matter to the BPCL project manager.

xxi. The contractor shall maintain Portable First Aid Boxes in fully equipped state at various places. The contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering First Aid competently until the arrival of professional help, in an accident situation.

Contractor's Safety Officer

The contractor's Safety officer is primarily responsible for writing and the upkeep of his Safety Plan, and any other identified required procedures as the project progresses. Other responsibilities include, but are not limited to, advising the SM and any members of the project team on Safety matters, assuring compliance with BPCL Safety Manual and any other relevant Safety related documents, ensuring audits and inspections are conducted on a regular basis as required, ensure that personnel, at all levels within their scope receive appropriate Safety training through organized induction and refresher courses and activity toolbox talks , provide assistance to assure they fully comply with their responsibilities for Safety, chairing Safety committee meetings and constant liaison with the BPCL Safety Engineer. PSE shall be appointed and notified to the Employer in due course.

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Appendix 4 : Facilities /Equipment for the Contractor's Safety Function

The following minimum facilities shall be provided:

S.No	Safety monitoring and Audio-Visual equipment details	Quantity
1	Portable hand held Digital Sound Level Meter (SLM)	
2	Portable hand held Digital Lux Meter	
3	Laptop computer with standard configuration including multimedia facilities.	
4	Colour Printer	
5	Computer Projector with Screen	
6	Overhead Projector	
7	35mm Camera	
8	Digital Camera with flash (4 Mega pixel minimum) with video facility	
9	Digital still Camera with flash (4 Mega pixel minimum)	
10	Portable loud speaker (for tool box talk and emergency purpose)	
11	Communication facilities like mobile phones and Walky talky	
12	Accident Investigation kit	

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Appendix 5: Indicative Contractor Toolbox Meeting Structure

TOOLBOX MEETING STRUCTURE	
Coordinator	Contractor Supervisor
Attendees	Entire Work Crew for the workplace / work activity (Assemble workforce in groups of manageable size so the talk is effective)
Agenda	Supervisors shall consider the following when formulating the daily agenda: Work Permit Conditions PPE Requirements Area and Task risk analysis Emergency protocol, numbers and Assembly Areas Emergency Exit Routes (for new personnel) Equipment Condition and inspection Emergency Exit Routes (for new personnel) Dissemination of Safety Bulletins Significant Incidents / Near Misses / Preventive actions / Incident reports, safety trends & findings of incident investigations
Frequency	Daily/Weekly
Minutes	Toolbox meetings shall be considered a formal communication process and the recording of minutes with the standard Project Toolbox meeting record form shall be used

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Appendix 6: Indicative Project Safety Statistics

Name of Project :

A : General

Indicator	Total
Man-hours Current Reporting Period	
Accumulated Man-hours (Since start of project)	
Days without any Lost Time Injury	

B. Lead Safety Indicators

	Target	Actual
Total Number of hazards/ unsafe conditions/ unsafe act Reported	Numbers	
Near misses and findings closed on time	100 %	
Safety audit and inspection findings closed on time	100 %	
Number of Monthly Safety Walks (against plan)	Numbers	
Number of Monthly Safety Committee Meetings	Numbers	
Number of Monthly Mass Communication Meetings	Numbers	

C. Lag Safety Indicators

	Target	Actual
Fatality	Zero	
Lost Time Injury	Zero	
First Aid Case	Zero	
Dangerous Occurrences/ Near Misses	Zero	
Spills	Zero	
Fires	Zero	
Asset damage Incident	Zero	
Traffic Incidents	Zero	
Security Incident	Zero	
Penalty Notices / Discipline Action Taken	Zero	

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Total Lost Time Incident Rate (per 1,000,000 man-hours worked)	Zero	
Total Compensation Paid	Zero	

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Appendix 7 : Project Safety Basic Safety Rules

1. Contractor shall appoint adequate number of qualified and experienced safety staff at the BPCL Project Location.
2. All equipment, tools, crane, vehicle etc. brought by the contractor shall be inspected to ensure compliance with the applicable Safety requirements. Only those equipment, tools, crane, vehicle etc that meets the requirements and are approved by the BPCL shall be permitted for use.
3. Such inspections shall be carried out independently as well as jointly by contractor and BPCL HSSE staff. Inspections checklists shall be used for these inspections.
4. Contractor employees shall comply with the BPCL HSSE procedures & policies as applicable at the concerned project location.
5. Contractor shall follow project safety management plan duly reviewed and approved by BPCL.
6. Contractor employees shall follow Safety precautions and procedures concerning specific operations and jobs. Work or task shall be performed according to established procedures and with the designated tools & equipment.
7. Contractor employees shall not start work until authorized by the area owner or work supervisor from BPCL or his authorized agency.
8. Contractor employees shall only carryout the assigned task under a work permit issued by the BPCL or his authorized agency.
9. Contractor employees shall not bring Radios, Mobile phones, lighters, matches, or any other form of ignition sources within project locations.
10. Firearms, ammunitions, knifes etc. shall be strictly prohibited at project locations and workers camps within Industrial Sector.
11. Contractor employees shall not carryout photography or use video camera within the project locations without written approval of BPCL concerned department.
12. No Smoking Policy shall be strictly followed for all projects.
13. All temporary buildings of contractors within project locations shall be located in an area approved by the BPCL area owner and HSSE Department.
14. All temporary offices, office wiring including accessories installed therein shall be subjected to inspection & approval of BPCL. Any changes to approved wiring or installation of new electrical accessories shall be submitted to BPCL for review and approval prior to implementation.
15. Contractor shall ensure that construction areas, fabrication shop, corridors, offices material storage area, workshops etc. have adequate natural or artificial lighting.
16. Contractor shall furnish adequate clean supply of potable water, containers disposable cups to their employees for drinking water.
17. Contractor shall furnish adequate portable toilet facilities for his employees. All portable toilets shall be kept clean and located in an easily accessible area. If they are to be used at night, the area shall have adequate illumination.
18. Contractor shall properly secure, transport, and use compressed gas cylinders. Cylinders not in use shall be capped and marked.
19. BPCL fire and emergency response equipment and systems shall not be used without authorization and/or for any non-emergency activity. Such equipment shall not be impaired (restricted access) by contractor work activity.
20. Contractor shall comply with applicable rules and regulations for disposal of debris, waste material including hazardous, toxic chemicals.
21. Contractor shall provide required safety signs, posters, warning lights, night lights, barricades and other devices/equipment necessary for all situations or for temporary hazards created by the contractors work activity.
22. All excavations made by the contractor shall be adequately protected to prevent sloughing of earth, by shoring or sloping and shall be protected against personnel slipping or falling into the excavation.
23. Contractor shall guard or place appropriate barricades around temporary openings in floor, temporary impairments to handrails, stairways, or walkways. Existing machinery or equipment guards shall not be modified or altered.
24. Work on live electrical systems shall be conducted in accordance with tag-out, lockout, and permit procedures.

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25. Contractor shall follow State Pollution Control Board regulations for safe handling, storage & disposal of materials from the work .
26. When it is necessary for a contractor to operate cranes or lifting operations within 4 meters of the vicinity of energized electrical lines, the contractor shall review the hazards and precautions with the Tenant concerned area supervisor / end user to determine whether the lines can be de-energized. If the lines are to remain energized, the contractor is responsible to install suitable guards to prevent an electrical arc or accidental circuit condition. For such situations contractor shall submit a method statement along with a checklist for verifying all requirements.
27. Contractor shall ensure identification of underground services /pipelines etc in consultation with end user / facility owner prior to execution of job.
28. Contractor shall ensure compliance to compatibility requirements for hazardous material and cylinders storage.
29. Contractor supervisory personnel shall develop method/system and implement it to ensure that all safety procedures are understood and followed. Contractor supervisory personnel shall, at all times, set a good safety example.
30. Contractors shall be accountable for their employees' compliance with the Tenant safety rules.
31. Where it is apparent that contractor employees are not following prescribed Tenant safety regulations, policies, or procedures, the person observing such situations should notify the Tenant Supervising Department, who will take the necessary action to ensure that safe work conditions are maintained.
32. Horseplay, fighting, gambling, possessions of firearms or explosives, use of regulated drugs or alcohol, being under the influence of drugs or alcohol, theft, vandalism, sabotage, and distribution of unauthorized literature shall not be permitted. Those involved in such activities shall be removed from the project location and shall be liable for punishment by applicable law.
33. **For Project Locations, within existing installations/plants,** Contractor shall not perform any of the following jobs without the specific permission of the area supervisor / end user:

    a. Make repairs or changes to existing equipment
    b. Operate any valve, switch, or instrument control device.
    c. Operate any utility services such as electricity, water, air, nitrogen, etc.
    d. Connect into existing pipelines
    e. Connect into existing sewers
    f. Connect into existing electrical system or electrically operated equipment
    g. Operate electrical equipment or electrical switches
    h. Enter any closed vessel, tank, container, pit, excavations, or other confined space
    i. Perform work involving radiography (X-ray etc.)
    j. Use entity's pipelines, electrical conduits, handrails, or structures as supports for loads, ladders, or scaffolds
    k. Use entity's structure, pipe or other equipment for attaching blocks, lines, or other services which apply loads on the equipment
    l. Install guy lines across electrical lines
    m. Operate cranes or derricks near electrical lines
    n. Work on any machinery while it is in operation
    o. Dispose any material in unauthorized areas
    p. Make excavations without adequate protection to prevent sloughing and without fencing to prevent personnel from failing into them
    q. Operate electrical equipment without grounding or ground fault circuit interruption (GFCI) protection
    r. Move suspended loads without securing load to prevent swinging
    s. Operate any metal-wheeled equipment without adequate protection for the street paving.

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ANNEXURE-XV TO SPECIAL CONDITIONS OF CONTRACT

1) OISD-192
2) OISD-207

OISD - GDN - 192

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SAFETY PRACTICES DURING CONSTRUCTION

Engineers India Ltd

OISD-GDN-192
Second Edition, April, 2016
First Edition, July, 2000



Oil Industry Safety Directorate

Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

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SAFETY PRACTICES DURING CONSTRUCTION

Prepared by

COMMITTEE ON
SAFETY PRACTICES DURING CONSTRUCTION

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Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

Preamble

Indian petroleum industry is the energy lifeline of the nation and its continuous performance is essential for sovereignty and prosperity of the country. As the industry essentially deals with inherently inflammable substances throughout its value chain – upstream, midstream and downstream – Safety is of paramount importance to this industry as only safe performance at all times can ensure optimum ROI of these national assets and resources including sustainability.

While statutory organizations were in place all along to oversee safety aspects of Indian petroleum industry, Oil Industry Safety Directorate (OISD) was set up in 1986 Ministry of Petroleum and Natural Gas, Government of India as a knowledge centre for formulation of constantly updated world-scale standards for design, layout and operation of various equipment, facility and activities involved in this industry. Moreover, OISD was also given responsibility of monitoring implementation status of these standards through safety audits.

In more than 25 years of its existence, OISD has developed a rigorous, multi-layer, iterative and participative process of development of standards – starting with research by in-house experts and iterating through seeking & validating inputs from all stake-holders – operators, designers, national level knowledge authorities and public at large – with a feedback loop of constant updation based on ground level experience obtained through audits, incident analysis and environment scanning.

The participative process followed in standard formulation has resulted in excellent level of compliance by the industry culminating in a safer environment in the industry. OISD – except in the Upstream Petroleum Sector – is still a regulatory (and not a statutory) body but that has not affected implementation of the OISD standards. It also goes to prove the old adage that self-regulation is the best regulation. The quality and relevance of OISD standards had been further endorsed by their adoption in various statutory rules of the land.

Petroleum industry in India is significantly globalized at present in terms of technology content requiring its operation to keep pace with the relevant world scale standards & practices. This matches the OISD philosophy of continuous improvement keeping pace with the global developments in its target environment. To this end, OISD keeps track of changes through participation as member in large number of International and national level Knowledge Organizations – both in the field of standard development and implementation & monitoring in addition to updation of internal knowledge base through continuous research and application surveillance, thereby ensuring that this OISD Standard, along with all other extant ones, remains relevant, updated and effective on a real time basis in the applicable areas.

Together we strive to achieve NIL incidents in the entire Hydrocarbon Value Chain. This, besides other issues, calls for total engagement from all levels of the stake holder organizations, which we, at OISD, fervently look forward to.

Jai Hind!!!

Executive Director
Oil Industry Safety Directorate

Engineers India Ltd.

FOREWORD

At the time of development of this document, 113 OISD standards, recommended practices and guidelines are applicable to the Oil and Gas installations of Public sector Oil Companies in India. 11 of these standards have been adopted by Petroleum and Explosives Safety Organisation (PESO) in various rules administered by them and thus the provisions of these standards are mandatory for entire Oil & Gas sector to that extent.

A few serious accidents have occurred in the recent past in India and abroad including vapour cloud explosion and fire at Oil terminal near Jaipur emphasised the need for the industry to review the existing provisions of various guidelines and statutory requirements.

With the above in view the Government of India directed the Oil Industry Safety directorate to develop a comprehensive document covering all the facets of Safety in Design, Operation and Maintenance, of depots and terminals being run by marketing divisions of Oil companies with an objective to strengthen the existing system.

The present guideline on "Safety Practices During Construction" has been prepared by the functional committee based on, existing standards, guidelines & recommended practices of OISD, the recommendations arising out of recent major accidents and their analysis, the accumulated knowledge and experience of industry members in India and updation of National and International codes and practices.

The provisions of this document, if implemented objectively, may go a long way in enhancing overall safety standard and reduce accidents in Oil Installations.

Users are cautioned that no standard can be substitute to the "judgment and experience of Engineers"

This document will be reviewed periodically for improvements based on the new experiences and better understanding. Suggestions are also invited from the users after it is put into practice to improve the document further. Suggestions may be addressed to:

The Co-ordinator
Committee on "Safety Practices during Construction"

Oil Industry Safety Directorate

Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

This document in no way supersedes the statutory regulations of Chief Controller of Explosives (CCE), Factory Inspectorate or any other statutory body, which must be followed as applicable.

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Though every effort has been made to assure the accuracy and reliability of the data contained in these documents, OISD hereby expressly disclaims any liability or responsibility for loss or damage resulting from their use.

These documents are intended to supplement rather than replace the prevailing statutory requirements.

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SECOND FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

LIST OF MEMBERS

Name	Organization	Status
S/Shri		
A K Gupta	DGM (HSE), IOCL	Leader
Dharmvir	Addl. Director, OISD	Member Coordinator
Ashok Dashputre	Vice President, RIL	Member
P K Agarwal	CM (HSE), IOCL	Member
D Jana	AGM-Construction, EIL	Member
Udoay Payyadi	Sr. Manager-Maintenance, HPCL	Member
Vijay Mohan	Addl. Director, CHT	Member
B K Rabha	Dy. CE(Instrumentation), OIL	Member
Sankar Raman V	CM-E&C, BPCL - Kochi Refineries Ltd.	Member
Yogesh J Nakhare	Manager-F&S, HPCL.	Member
Pushp Khetarpal	Sr. Vice President (O&M), Petronet LNG	Member
Upinder Kumar	Petronet LNG	Member
A K Arora	Addl. Director, OISD	Member

In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this Guideline.

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FIRST FUNCTIONAL COMMITTEE ON SAFETY PRACTICES DURING CONSTRUCTION

	NAME	ORGANISATION
LEADER		
	Shri A.K. Tandon	EIL, New Delhi.
MEMBERS		
1.	Shri U.M. Rao	GAIL, Noida.
2.	Shri K.N. Ravindran	CRL, Cochin
3.	Shri P.K. Anand	ONGC, Mumbai.
4.	Shri H.N. Das	ONGCL, Nazaria.
5.	Shri Jagnandan Tyagi	IOC(PL) Nodia.
6.	Shri M.C Lohar	IBP Co. Ltd., Calcutta.
7.	Shri J.C. Agrawal	IOC, Mktg, New Delhi.
8.	Shri S.M. Ghotavadekar	HPCL, Mumbai.
9.	Shri Sanjoy Ghose	BPCL, Mumbai.
10.	Shri H. C Jha “Hari”	IOC-Panipat Refinery.
11.	Shri Suhas Kate	HPCL, Visakh.
Member-Coordinator		
	Shri A.K. Ranjan	OISD, New Delhi

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SAFETY PRACTICES DURING CONSTRUCTION

1.0 INTRODUCTION

Safety in Construction Management deserves utmost attention especially in the hydrocarbon industry, such as Exploration, Refineries, Pipelines and Marketing installations, Gas Processing units etc. Construction is widely recognised as one of the accident prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel, damage to environment which needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behaviour, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, lack of proper JSA (Job Safety Analysis) and use of improper / inadequate PPEs, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality of materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to in built safety into the system.

The objective of this document is to provide practical guidance on technical and educational framework for health, safety and environment in construction with a view to:

(a) prevent accidents and harmful effects on the health of workers arising from employment in construction;
(b) ensure appropriate safety during implementation of construction;
(c) provide safety practice guidelines for appropriate measures of planning, control and enforcement.
(d) protect environment.

2.0 SCOPE

This document specifies broad guidelines on HEALTH, SAFETY AND ENVIRONMENT practices to be adhered to during construction activities including green field projects in oil industry. However, before commencing any job, specific hazards and its effects should be assessed and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. For Personal Protective Equipment, OISD-STD-155 (Part I&II) shall be referred to. The scope of this document does not include the design aspects and quality checks during construction.

3.0 DEFINITIONS

Definitions of various terminology are given below:

- **Adequate, appropriate or suitable** are used to describe qualitatively or quantitatively the means or method used to protect the men, machinery, material, property and enviroment.

- **By hand:** The work is done without the help of a mechanised tool.

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- **Competent Authority:** A stautory agency having the power to issue regulations, orders or other instructions having the force of law.

- **Competent person:** A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.

- **Construction site:**

  A worksite involving new construction, modification or maintenance of existing facility, shutdown related activity, demolition, housekeeping etc.

- **Environment:**

  Environment includes water, air and land and the interrelationship which exists among and between water, air and land and human beings, other living creatures, plants, microorganisms and property.

- **Execution agency:**

  Any entity / person, having contractual obligation with the owner and who employs one or more workers on a construction site.

- **Hazard:** A condition or a set of conditions which has potential of causing injury to person, damage to property or environment.
- **Health:** Soundness of body covering Physical, Emotional, Psychological and Intellectual conditions of a worker which assists the attainment of the objectives.
- **Means of access or egress:** Passageways, corridors, stairs, platforms, ladders and any other means for entering or leaving the workplace or for escaping in case of danger.

- **Owner:** Any entity **/** person for whom construction job is carried out.

  It shall also include owner's designated representative/ consultant/ nominee/ agent, authorised from time to time to act for and on its behalf for supervising/ coordinating the activities of the execution agency.

- **Scaffold:** Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance.
- **Safety :** Prevention & protection from exposure to Hazard.

- **Worker:** Any person engaged in construction activity.

- **Workplace:** Owner's designated premises where workers need to be present by virtue of their involvement in the construction activity**.**

4.0 GENERAL DUTIES

4.1 GENERAL DUTIES OF EXECUTION AGENCIES

4.1.1 Execution agency should:

i) provide means and organisation to comply with the Health, safety and environment protection measures required at the workplace.

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ii) provide and maintain workplaces, plant, equipment, tools and machinery and organise construction work so that, there is no risk of accident or injury to health of workers. In particular, construction work should be planned, prepared and undertaken so that:

(a) dangers liable to arise at the workplace, are prevented;
(b) excessively or unnecessarily strenuous work positions and movements are avoided;

- organisation of work takes into account the safety and health of workers and also environment protection;
- materials and products used are suitable from Health safety and environment protection point of view;

(c) working methods are adopted to safeguard workers against the harmful effects of chemical, physical and biological agents.

iii) establish committees with representatives of workers and management or make other arrangement for the participation of workers in ensuring safe working conditions.

iv) arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.

v) provide such supervision to ensure that workers perform their work with due regard to safety and health of theirs as well as that of others.

vi) employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.

vii) satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.

viii) ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.

ix) organise for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.

x) establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.

- provide appropriate first aid, training and welfare facilities to workers as per various statutes like the Factories Act 1948, Building & Construction Workers Regulation (BOCWR), etc. and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement as per OISD-STD-155 (Part I & II) on Personnel Protective

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Equipment. They should also provide access to workers to occupational health services.

- educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect health, safety and environment.

xi) ensure that except in an emergency, workers unless duly authorised, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.

xii) ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorised to operate, maintain or use.

xiii) ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, machines or vehicles and heavy equipment etc.

xiv) obtain the necessary clearance/permits as required and specified by owner.

Arrangement for drinking water, toilet facilities, a creche and transport arrangement etc. to be provided as per statutory requirement.

xv) deploy a safety officer at site as per the requirement of Factory Act 1948/ Building & Construction Workers Regulation (BOCWR)/ Criticality of the job.

xvi) ensure that all employees/workmen undergo medical examination as required under the law or under the contract provision and keep a record of the same.

xvii) obtain the police verification of the workers/ supervisors arranged by him and the same is to be submitted to the owner.

xviii) not permit any employee/workmen/visitor to enter the work area under the influence of alcohol or any drugs.

4.2 GENERAL DUTIES OF OWNERS

4.2.1 Owners should:

i) co-ordinate or nominate a competent person to co-ordinate all activities relating to HEALTH, SAFETY AND ENVIRONMENT on their construction projects;

ii) inform all contractors on the work site / project of special risks to HEALTH, SAFETY AND ENVIRONMENT;

iii) ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to HEALTH, SAFETY AND ENVIRONMENT practices before starting the job.

5.0 SAFETY PRACTICES AT WORK PLACES

5.1. GENERAL PROVISIONS

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5.1.1 All openings and other areas likely to pose danger to workers should be clearly indicated and accident prevention measures taken as required. The working area should be clearly de-marketed to keep the workers in that area only.

5.1.2 Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement as per OISD-STD-155 (Part I & II). They should be trained to use personal protective equipment including their limitations.

5.1.3 Never use solvents, alkalis and other oils to clean the skin.

5.1.4 Lift the load with back straight and knees bent. The contractor shall ensure at his construction site, no worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or pipelines exceeding in weight as per The Factory Act 1948 / Rule 38 of Building & Construction Workers Regulation (BOCWR), unless aided by another worker or device.

5.1.5 Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles. Also the tools should be suitable for a particular job and rated accordingly.

5.1.6 No loose clothing should be allowed while at construction site.

5.1.7 Start work only after proper authorization viz Work permit etc.

5.1.8 Job safety analysis to be done for all critical works.

5.1.9 Hydra should not be used for transportation of hook loaded materials.

5.1.10 Rope ladders should not be used at construction sites.

5.2 MEANS OF ACCESS AND EGRESS

Adequate and safe means of access (atleast two, differently located) to and egress from all workplaces should be provided. Same should be displayed and maintained. Escape routes should be marked prominently in workers friendly language. The escape routes should not be blocked at any point of time and same to be made understand to the workers.

5.3 HOUSEKEEPING

5.3.1 General Housekeeping shall be carried out by the contractor and he will ensure;

i) proper storage of materials and equipment;

ii) removal of scrap, inflammable material, waste and debris at appropriate intervals including slippery materials. (construction sand on road, oil/ lubricants, resins, etc.).

iii) to provide containers for segregation of disposal of debris at required places and regular cleaning of the same.

5.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.

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5.3.3 Workplaces and passageways, that are slippery owing to oil, grease or other causes, should be cleaned up or strewn with sand, sawdust, ash etc.

5.3.4 All surplus earth and debris are removed/disposed off from the working areas to officially designated dumpsites. The debris like plastics, packing material, rubber items should not be allowed to burn. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact, shall be covered while moving.

5.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES

5.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.

5.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.

5.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.

5.4.4 SOP of crane operation should be adhered to. The crane jacks/legs should be parked on compacted surface to avoid tilting.

5.5 PREVENTION OF UNAUTHORISED ENTRY

5.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorised persons.

5.5.2 Visitors should not be allowed access to site(s) unless accompanied by or authorised by a competent person. All authorized visitors should report at the site office. Contractor shall provide visitor's helmet (helmet with visitor sticker) and other PPEs like Safety Shoe, reflective jacket, respiratory protection etc. as per requirement of the site. All the workers to have photo IDs including the staff of vehicles used in the job.

5.6 FIRE PREVENTION AND FIRE FIGHTING

5.6.1 All necessary measures should be taken by the executing agency and owner to:

i) avoid the risk of fire;
ii) control quickly and efficiently any outbreak of fire;
iii) bring out a quick and safe evacuation of persons.
iv) Inform unit/fire station control room, where construction work is carried out within existing operating area.
v) DMP should be in place for the same.

5.6.2 Combustible materials such as packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place. To be disposed periodically away from site at designated place and assigned manner.

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5.6.3 Places where workers are employed on works prone to danger of fire should be provided with:

i) suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
ii) an adequate water supply at sufficient pressure meeting the requirements of various OISD standards.
iii) required PPEs.

5.6.4 To guard against danger at places having combustible material, workers should be trained in the action to be taken in the event of fire, including the use of means of escape.

5.6.5 At sites having combustible material, suitable visual sign boards should be provided to indicate clearly the direction of escape in case of fire.

5.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected and if possible marked in fluorescent colours particularly in high structures and where access is restricted.

5.7 LIGHTING

5.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.

5.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.

5.7.2 Artificial lighting should not produce glare or disturbing shadows.

5.7.3 Lamps should be protected by guards against accidental breakage.

5.7.4 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

5.7.5 For temporary lighting connection, mostly neutral and phases are connected and insulation tapes are provided. It is better to stagger the neutral and phase connection so that even if the tape gets removed from the joints, there will be no short circuit/ spark between neutral and phase due to staggering of neutral and phase.

5.7.6 All the temporary lighting/ machine connections are to be provided from a three core cable for better safety.

5.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS

5.8.1 General Provisions

i) Plant, machinery and equipment including hand tools, both manual and power driven, should:
   a) be of proper design and construction, taking into account health, Safety and ergonomic principles.
   b) be maintained in good working order;
   c) be used only for work for which they have been designed.
   d) be operated only by workers who have been authorised and given appropriate training.

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e) be provided with protective guards, shields or other devices as required.

ii) Adequate instructions for safe use should be provided.

iii) Standard operating procedures should be established and used for all plant, machinery and equipment.

iv) Operators of plant, machinery and equipment should not be distracted while work is in progress.

v) Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.

vi) Where trailing cables or hose pipes are used they should be kept as short as practicable and not allowed to create a hazard.

vii) All moving parts of machinery and equipment should be enclosed or adequately guarded.

viii) Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.

ix) Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

5.8.2 Hand tools

i) Hand tools should be repaired by competent persons.

ii) Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.

iii) When not in use and while being carried or transported, sharp tools should be kept in sheaths, shields, chests or other suitable containers.

iv) Only insulated or non-conducting tools should be used on or near live electrical installations.

v) Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

5.8.3 Pneumatic Tools

i) Operating triggers on portable pneumatic tools should be:
   a) so placed as to minimise the risk of accidental starting of the machine.
   b) so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.

ii) Hose and hose connections for compressed air supply to portable pneumatic tools should be:

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a) designed and tested for the pressure and service for which they are intended;
b) fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.

iii) Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel.

iv) Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

5.8.4 Electrical Tools

i) Low voltage portable electrical tools should generally be used.

ii) All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.

iii) All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

iv) No temporary connected appliance shoud be left connected in the socket. Its plug should be immediately removed after use.

5.8.5 Engines

i) Engines should:

a) be installed so that they can be started safely and the maximum safe speed cannot be exceeded.
b) have controls for limiting speed.
c) have devices to stop them from a safe place in an emergency.
d) have their batteries top covered with insulating material.
e) have radiator fan covers in place.

ii) IC engines should not be run in confined spaces unless adequate exhaust ventilation is provided or the exhaust should be installed outside the confined place at suitable height.

iii) When IC engines are being fuelled:

a) the engine should be shut off.
b) care should be taken to avoid spilling fuel.
c) no person should smoke or have an naked light in the vicinity.
d) a fire extinguisher should be kept readily available.

iv) Secondary fuel reservoir should be placed outside the engine room.

6.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

- Excavation
- Scaffolding, Platforms & Ladders
- Structural Work, Laying of Reinforcement & Concreting
- Road Work (Laying of roads)
- Cutting /Welding
- Working in Confined Space

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- Proof/Pressure Testing
- Working at Heights
- Handling & Lifting Equipment
- Vehicle Movement
- Electrical
- Offshore
- Demolition
- Radiography
- Shot blasting/ spray painting
- Work above water

Work permit system as per requirement of OISD-STD-105 shall be followed for various construction activities. As regards the activities at work places including grass root project sites if not covered under OISD-STD-105, owner shall develop a suitable methodology for execution of various construction activities under work permit system for safe execution of the works.

The safe practices to be followed during the implementation of above construction activities are given below:

6.1 EXCAVATION

6.1.1 All excavation work should be planned and the method of excavation and the type of support work required should be decided considering the following:

i) the stability of the ground including the chances of seepage of water;
ii) the excavation will not affect adjoining buildings, structures or roadways;
iii) to prevent hazard, the Hydrocarbon lines, water, electrical and other above ground & underground public utilities should be shut off, re-routed or disconnected, if necessary; If such a presence is envisaged, clearance to be taken from respective competent authority/ person.
iv) the position of culvert/bridges, temporary roads and spoil heaps should be determined;
v) a signed rough sketch of the excavation site to be prepared and made the workers understand

6.1.2 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required should be decided based on good engineering practices and recorded.

6.1.3 All excavation work should be supervised by a competent person.

6.1.4 Sites of excavations should be thoroughly inspected:

i) daily, prior to each shift and after interruption in work of more than one day;
ii) after every blasting operation;
iii) after an unexpected fall of ground;
iv) after substantial damage to supports;
v) after a heavy rain, frost or snow;
vi) when boulder formations are encountered.
vii) for cracks in the nearby buildings or area as the excavation progresses and the same to be reviewed.

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6.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth upto 3.0m should be maintained. Based on site conditions, provide proper slope, usually 45^0,and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.

6.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or depth of trench whichever is greater.

6.1.7 Don't allow vehicles to operate too close to excavated area. Maintain atleast 2m distance from edge of excavation or depth of trench whichever is greater. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.

6.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.

6.1.9 If an excavation is likely to affect the stability of a structure on which persons are working, precautions should be taken to protect the structure from collapse.

6.1.10 Barricade at 1m height (with red & white band/self glowing caution board) should be provided for excavations beyond 1.0 m depth. Provide two entries/exits for such excavation through proper means. Lighting arrangements to be made to avoid any accidental fall in the excavated portion even when work is not in progress.

6.1.11 Necessary precautions should be taken for underground utility lines like cables, sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.

6.1.12 Water shall be pumped/ bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.

6.1.13 During / after rains, the soil becomes loose. Take additional precaution against collapse of side wall. During rains excavation should be avoided.

6.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.

6.1.15 In case of mechanised excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. This area of reach of mechanical shovel should be marked / barricaded suitably. The mechanised excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.

6.1.16 In case of blasting, follow strictly IS:4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation.

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6.2 SCAFFOLDING, PLATFORMS & LADDERS

System of tagging shall be followed to indicate status of `Fit-for-Purpose' certification by a competent person for the scaffoldings. Green Tag shall indicate `Fit-for-Purpose' whereas Red Tag shall indicate `Unfit-for-purpose'. Accordingly only Red Tag shall be displayed during Erection & Dismantling.

All personnel engaged in erecting, using, dismantling scaffolds shall use full body safety harness with double lanyard with shock absorber connected with personal fall arrestor which should be secured to a properly designed anchor.

6.2.1 Scaffold related guidelines

General Requirements

Categories and Classification

Most scaffolds fall into one of the four primary categories:

- Tube and coupler scaffold
- System scaffolds e.g. Cup lock, Ring lock, H frame scaffold
- Suspension(or Suspended) scaffold
- Mobile scaffold
- Special scaffold

Scaffolds are classified according to their intended use as:

- Light duty
- Medium duty (General Purpose)
- Heavy duty

Type of Scaffolding	Load duty	Light		Medium	Heavy/Special		
	Maximum Safe load in Kg/m^2	75	150	225	300	450	600
Tubular with clamps	Max. bay length (distance between two verticals) in Meter	2.7	2.2	1.8	1.4	1.0	0.8
Cup / Ring lock		2.5	2.0	1.5	1.25	1.0	NA

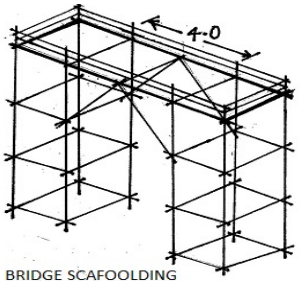
Conditions where special scaffolding procedure is required:

1. Height of the scaffolding is more than 30 meters.

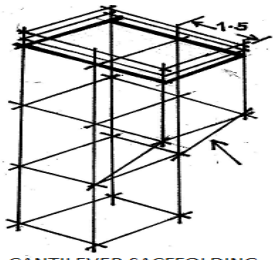
2. Scaffolding is special in nature/ type: cantilever more than 1 .5 meters, bridge more than 4 meters, scaffolding for machine/ equipment maintenance requiring frequent modifications, offshore scaffold, hanging scaffold; wooden scaffold (for specific use e.g. cooling tower), etc.

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BRIDGE SCAFOOLDING



CANTILEVER SACFFOLDING

For all such cases, but not limited to, in addition to checklist, a plant specific procedure cum checklist based on additional risk is to be prepared & validated by a competent person (example: procedure for erection/ dismantling shall be prepared and followed. If need felt, help from Engineering Cell/Third Party may be taken for checking proposed scaffold in respect of design and load carrying capacity etc.).

Specifications of Scaffolds

Applicable to all Scaffolds

1. All elevated structures/ working platform areas should be guarded on all sides.

2. Railings and toe boards should be provided on the platform.

3. Scaffolds shall be designed to support at least 4 times the anticipated weight of Men, material and wind force.

4. Make certain that all scaffolds are in plumb and level at all times.

5. Scaffolds shall be secured from tipping when the scaffold height exceeds four times its minimum base dimension.

6. Scaffolds must be constructed at least **3** planks wide unless location makes this physically impossible.

7. Landing platform should be provided at every 9 meter of height or less.

8. The members of scaffolds should extend at least 6" on either ends but not more than 12". They should be fastened on both ends and laid tight by clamps.

9. All scaffoldings having height to base ratio more than 4 shall be secured firmly with permanent structure in X and Y direction at least every 6 meters.

10. Scaffold which spread to 20 meter or more should have two accesses preferably opposite side.

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11. Plastic Checklist holder with red marked to be used as a “Not Fit-for-Purpose” warning signboard and Green colour combined checklist to be used as “Fit-for-Purpose” signboard.

12. Keep distance of at least 150mm between high temp Pipelines or equipment and scaffolding.

13. Safe distance from overhead electrical lines to be maintained as per Site electrical safety procedures.

Applicable to Tube-and-coupler scaffold

1. Tube and coupler scaffolds over 30 meter in height must be Designed by a competent professional engineer (who by extensive knowledge, training, and experience have successfully demonstrated his ability to carry out scaffold design and load calculations).
2. Maximum height of first horizontal member (Ledger) of scaffolds from the Ground shall be 2.2 meters. Lower lift can be considered for heavy loads depending upon the scaffold design. When scaffold is more than 6 meter height for carrying heavy load, kicker lift should be provided at a height of 150mm from ground.

3. The top rail shall be at height of 900-1200 mm and Mid rails must be installed approximately halfway between the top rail and the platform surface. Toe boards (150mm) should be securely attached to the working platform. Toe boards are generally applicable to working platform and not for landing platforms.

4. The bay length & width depends on the height and the load to be carried by the scaffold.

5. Bracings shall be fitted up to full height of scaffold.

6. Standards should be joined having overlap of min 600 mm using three equally spaced swivel clamps or end to end using sleeve/pin type coupler.

7. Ledgers should be joined having overlap of min 600 mm using three equally spaced swivel clamps or end to end using sleeve coupler.

8. Base plate 150 x 150 x 6mm shall be used to support all vertical pipes of Scaffolds.

9. Sole plate shall be used at all unpaved area to support base late.

10. Scaffolding platform Grating shall be tied with clamp at both ends, and scaffolding platform Grating shall not overhang more than 150 mm and shall be at least 150 mm away from hot surface.

11. Every scaffold shall be provided with certified ladder and extending its free end shall be above platform by 1000 mm/ four rungs.

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Applicable to Mobile scaffolds

1. Attach castors with plain stems to the panel or adjustment screw by pins or other suitable means.
2. Apply castor brakes/lock at all times when scaffolding is not being moved.
3. Do not ride rolling scaffoldings.
4. Remove all material and equipment from platform before moving scaffolding.
5. Do not try to move rolling scaffolding without sufficient help. Watch out for holes protrusions in the floor and for overhead obstructions.
6. Do not use brackets on rolling scaffoldings without first considering the overturning effect.

Design Criteria

- All types of scaffolds shall be strong enough of carrying and transmitting all types of loads to the ground. All scaffolds shall be adequately secured, stiffened, both longitudinally and transversely.
- Scaffolding determines as per the requirement and use of scaffold such as:
    - Purpose of scaffolding
    - Loading on scaffold platform
    - Required height
    - Sufficient work place
    - Surrounding environment

Storage and inspection of materials

- All scaffolding material shall be stored at designated location to protect them from adverse environment conditions such as corrosion, weather.
- Storage racks/ Locations/ areas shall be clearly identified.
- Storage facility of scaffold material shall be properly constructed for its stability and load bearing capability.
- Steel pipes and scaffolding platform Grating shall be stacked horizontally according to length. Fittings, Couplers shall be stored in separate bins.

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- Defective material shall be removed from site.
- Scaffolding material such as tubular, planks, clamps etc. shall be inspected annually for contractor owned material by contractor. The visual inspection shall cover 100% scaffold materials.

Transportation and handling of scaffolding material

- Make sure that scaffold pipe shifting done in vehicle of appropriate length.
- Special safety care to be taken while shifting or lifting pipes manually.
- Rope and pulley should be used to lift pipe from height.

Safety requirements

A risk assessment to access scaffold hazards through inspection and work method statement for relevant work activities shall be made before erecting, dismantling, moving, or modifying scaffold. Examples of hazards to be considered include the following:

- Working at/from heights.
- The presence of nearby electrical lines or process equipment (e.g. hot line, vents, drains, etc.). Necessary safety distances shall be maintained as specified in site level electrical safety procedure.
- Possible emergency scenario, escape routes and responses.
- The condition and loading of working surfaces /platform /scaffold pipes and other components or loose material such as clamps/ bolts on the working platforms.
- The presence and activity of other people and equipment in the vicinity of the work.
- The weather (Heavy rain, high wind velocity-more than 20 knots, etc).
- Erection during dark hours.
- Scaffold collapse.
- Manual task (Manual Material Handling).
- Access and egress during normal and emergency condition.
- The effect of heavy equipment movement in close vicinity such as within 4 meters to be considered for direct hit and sagging of land in case of unpaved area.

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This assessment is a part of the work permit process but should also be extended to the specific job planning of the crew performing the work. Appropriate actions shall be taken to mitigate the hazards identified during the assessment.

Fall protection when erecting, dismantling, and modifying scaffolds shall be under the direction of a competent person (Scaffold Supervisor). Scaffold erectors (Scaffolder) shall use personal fall-protection systems that provide continuous fall protection while erecting, dismantling or modifying scaffolds unless the determination is made by a competent person that fall protection is not feasible or it creates a greater hazard. Fall protection can be accomplished through the use of adequate anchorages that are independent of the scaffold or by using scaffold systems and components that are approved by the manufacturer as adequate anchorages. Employees/workmen shall use appropriate fall-arrest equipment.

The footing for supported scaffolds shall be sound, rigid, and capable of supporting the maximum intended load, including the weight of the scaffold.

Scaffold platform grating shall be fastened on both ends and laid tight by scaffold clamps/couplers.

Manufacturer's guidelines for proprietary scaffolds (e.g. Cup lock, ring lock, H frame, Insulating modular scaffolds) shall be followed unless a competent person approves the variance and provided the variance complies with applicable regulations and generally accepted scaffold engineering practices.

Proprietary/special scaffold manufacturer's guidelines for erection and inspection should be available with users, and with plant maintenance engineer for reference.

The following safe practices with respect to scaffolds shall be followed:

- There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound material. Scaffolding material shall be inspected and used, only if found in good condition. Avoid using equipment whose strength is not known.

- Provide adequate Base for scaffolding posts. Metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections. Use right angle couplers for joining vertical to horizontal members and swivel type couplers for joining bracing with ledgers. For joining vertical load bearing members (standards), "joint pin" type couplers can also be used. The couplers shall be of a structural metal, such as drop-forged steel, malleable iron, or structural grade aluminum (use of gray cast iron is prohibited).

- Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing. Fasten all braces securely.

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- Where scaffoldings are erected above walkways or work areas, the space between toe board and railing should be screened (e.g. Safety net, Metal sheets).

- Whenever work is being done over men who are working on scaffolding, overhead protection should be provided on the scaffolding.

- Restrain free-standing scaffolding towers from tipping by guying or other means.

- A safe and convenient means of access shall be provided to the platform level. Means of access may be a portable ladder, fixed ladder, ramp or runway or stairway. The ladder shall be so installed that there supporting member (pipe) is just below ladder rung. This is to avoid tripping hazard, especially while using the ladder.

- During erection, the ladder shall be installed as early as practicable, but not later than first two horizontal members (Ledgers). This is to facilitate Scaffolder while erecting the scaffold.

- During erection/ dismantling, scaffolder shall use 'T' steps to minimize risk of accidental fall/ slip.

- Ladder should be provided with tie rods/studs at top and bottom rungs and secured to scaffolding with ladder clamps, at least 2 locations for a ladder of length up to 4 m & at 3 locations for more than 4 m long ladder.

- The horizontal member/ ledger on which ladder is to be fixed, must be clamped to two subsequent standard using fixed clamps.

- Do not cantilever or extend putlogs / trusses as side brackets, without thoroughly considering the loads to be applied.

- Do not climb scaffold using cross braces.

- Do not use ladders or makeshift devices on top of scaffoldings to increase the height.

- Have at least 12" overlap and 6" extension beyond centerline of support or cleat at both ends to prevent sliding.

- Do not allow unsupported ends of planking to extend an unsafe distance beyond supports.

- Planks shall be non-greasy and free from defects.

- Access to working platform shall be suitably protected against inadvertent fall by providing swing members/ swing gate or chains.

- When scaffolding is no longer required, request for dismantling of scaffold shall be sent to scaffolding supervisor through work permit.

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- Scaffold shall be removed from top bracings. Ties, rackers etc. should not be removed from section lower than the one which is being dismantled.
- Do not throw or allow falling to ground any scaffold member, board or fittings.
- Dismantled scaffold material shall be neatly stacked, away from the site until whole of scaffold has been dismantled.

6.2.2 Metal as material of construction

i) A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.

ii) Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.

iii) Every scaffold should be constructed, erected, properly secured/ tied and maintained so as to prevent collapse or accidental displacement during erection, while in use, in idle state or dismantling.

iv) Every scaffold and part thereof should be constructed :

(a) in such a way so as not to cause hazards for workers during erection and dismantling;
(b) in such a way so as guard rails and other protective devices, platforms, ladders, stairs or ramps can be easily put together;
(c) with sound material and of requisite size and strength for the purpose for which it is to be used and maintained in a proper condition.

v) Boards and planks used for scaffolds should be protected against splitting.

vi) Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.

vii) Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.

viii) Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.

ix) Scaffolds should be designed for their maximum load as per relevant codes.

x) Scaffolds should be adequately braced.

xi) Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.

xii) A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.

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xiii) Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.

xiv) Scaffolds should be inspected and certified:

(a) before being taken into use;
(b) at periodic intervals thereafter as prescribed for different types of scaffolds;
(c) after any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

xv) Inspection should more particularly ascertain that:

(a) the scaffold is of suitable type and adequate for the job;
(b) materials used in its construction are sound and of sufficient strength;
(c) it is of sound construction and stable;
(d) that the required safeguards are in position.

xvi) A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.

xvii) If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

6.2.3 Lifting appliances on scaffolds (CHAIN PULLEY BLOCKS, PULLERS)

i) When a lifting appliance is to be used on a scaffold:

(a) the parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
(b) any movement of the scaffold members should be prevented;
(c) if practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

6.2.4 Prefabricated scaffolds

i) In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.

ii) Frames of different types should not be intermingled in a single scaffold.

iii) Scaffolding shall be erected on firm and level ground. In case of loose or uneven terrain, care should be taken to see that the scaffolding is on firm footing by leveling / compacting or other means.

iv) All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.

v) Entry to scaffolding should be restricted.

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vi) Erection, alteration and removal shall be done under supervision of experienced personnel.

vii) Use of barrels, boxes, loose bricks etc., for supporting scaffolds shall not be permitted.

viii) Each supporting member of platform shall be securely fastened and braced.

ix) Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.

x) Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided. If it is unavoidable overhang should be effectively secured to prevent tipping.

xi) The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.

xii) Erect ladders in the “four up-one out position”

xiii) Ladder shall be properly secured with the structure.

xiv) Use non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.

xv) When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in “four up-one out position.”

xvi) Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.

xvii) The width of ladder shall not be less than 300mm and rungs shall be spaced not more than 300mm.

xviii) Every platform and means of access shall be kept free from obstruction.

xix) If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.

xx) Workers shall not be allowed to work on scaffolds during storms or high wind. After heavy rain or storms, scaffolds shall be inspected before reuse.

xxi) Don't overload the scaffolding. Remove excess material and scrap immediately.

xxii) Dismantling of scaffolds shall be done in a pre-planned sequential manner.

6.2.5 Suspended scaffolds/ boatwain's chair

In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.

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(a) platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;
(b) the number or anchorage should be compatible with the dimensions of the platform;
(c) the safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;
(d) the anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;
(e) the ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;
(f) before use, the whole structure should be checked by a competent person.

6.2.6 Bamboo Scaffolding

i) It should not be used in oil & gas installations and in the areas where hot work is to be done.

ii) For construction and maintenance of low rise residential and office buildings, situated outside explosive licensed area, bamboo scaffold, if unavoidable, should conform to provisions given in IS-3696 (Part 1)-1987.

6.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

6.3.1 General provisions

i) The erection or dismantling of buildings, structures, civil engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.

ii) Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.

iii) Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it. Conformity with design during job execution shall be certified by the competent person and the relevant records shall be maintained.

iv) Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilising are easily fixed to the formwork structure.

v) Proper methodology based on the design of the building / structure to be developed and approved by competent person before resorting to dismantling / modifications.

vi) All works / facilities should be certified for structural stabilities by a competent person and on statutory requirement completed before putting to use.

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6.3.2 Erection and dismantling of steel and prefabricated structures

i) The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:

(a) ladders, gangways or fixed platforms;
(b) platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
(c) safety harnesses and lifelines supported on properly designed anchor, catch nets or catch platforms;
(d) Mechanical / Power-operated mobile working platforms;
(e) Proper Personal Protective Equipment.

ii) Steel and prefabricated structures should be so designed and made that they can be safely transported and erected. Route survey to be carried out from works to construction site route considering the load bearing capacity of the bridges, height of the bridges en-route and maximum width and length permissible without causing any hazard to public, the route and the equipment.

iii) In addition to the need for the stability of the part when erected, the design should explicitly take following into account:

(a) the conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
(b) Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them easily on the structural steel or prefabricated parts.

iv) The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:

(a) to withstand with a sufficient margin the stresses to which they are subjected;
(b) Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appli-ance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
(c) To avoid imbalance or distortion of the lifted load.

v) Storeplaces should be so constructed that:

(a) there is no risk of structural steel or prefabricated parts falling or overturning;
(b) storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmo-spheric conditions;
(c) racks are designed and secured on firm ground so that units cannot move accidentally.

vi) While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.

vii) Every lifting appliance should:

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(a) be suitable for the operations and not be capable of accidental disconnection;
(b) be approved or tested as per statutory requirement.

viii) Lifting hooks should have safety latch (self closing type).

ix) Lifting hooks, Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:

(a) be of such shape and dimensions as to ensure a secure grip without damaging the part;
(b) be marked with the maximum permissible load in the most unfavourable lifting conditions.
(c) be periodically inspected and certified to ensure further usage as per requirement of factory act / Building & Construction Workers Regulation (BOCWR).

x) Structural steel or prefabricated parts should be lifted only after rigging plan approved by competent person to prevent them from spinning, slipping or dropping accidentally.

xi) When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.

xii) While structural steel or prefabricated parts are being erected, the workers should be provided with appliances such as guiding ropes for guiding them as they are being lifted and set down, so as to avoid crushing of hands and to facilitate the operations. Use of such appliances should be ensured.

xiii) A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be affected, even by external factors such as wind and passing loads before its release from the lifting appliance.

xiv) At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.

xv) During transportation within the construction area, attachments such as slings and straps mounted on structural steel or prefabricated parts should be securely fastened to the parts. Vehicle loading should be such that the vehicle and the load remain stable at all positions during transportation and unloading.

xvi) Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.

xvii) When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.

xviii) When adverse weather conditions such as snow, hailstorm, rain and wind or reduced visibility, etc. entail risks of accidents, the rigging work should be interrupted after taking necessary safety precautions.

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xix) If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.

xx) The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a properly designed support.

xxi) Structural steel parts that are to be erected at a height should as far as practicable be assembled on the ground.

xxii) When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded

xxiii) Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.

xxiv) Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.

xxv) Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.

xxvi) Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

xxvii) All structures should be designed for either permanent anchors or provision for erection of anchors as and when required to support life line during any Maintenance work etc. during life of the structure. The point of provision of anchor should be indicated through suitable signage for ease of use as and when required.

6.3.3 Reinforcement

i) Ensure that workers use Personnel Protective equipment like safety helmet with chin straps, safety shoes, gloves, full body safety harness, safety goggles, etc.

ii) Don't place the hand below the rods for checking clear distance. Use measuring devices.

iii) Don't wear loose clothes while checking the rods.

iv) Don't stand unnecessarily on cantilever rods.

v) To carry out welding/cutting of rods, safety procedures/precautions as mentioned in Item No. 6.5 to be followed.

vi) For supplying of rods at heights, proper staging and/or bundling to be provided.

vii) Ensure barricading and staging for supplying and fixing of rods at height.

viii) For short distance carrying of materials on shoulders, suitable pads to be provided.

ix) While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not

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extend 1/3rd of deck length or 1.5 Meters whichever is less and tied with red flags/lights.

x) Reinforcement rods, cut pieces etc. should be properly stored at identified locations and the scrap should be disposed off promptly on regular basis.

6.3.4 Concreting

i) Ensure stability of shuttering work before allowing concreting.

ii) Barricade the concreting area while pouring at height/depths.

iii) Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.

iv) Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may affect their integrity.

v) Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.

vi) Use Personal Protective Equipment like gloves, safety shoes, full body safety harness, safety goggles, etc. while dealing with concrete and wear respirators for dealing with cement.

vii) Earthing of electrical mixers, vibrators, etc. should be done and verified.

viii) Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter the drum for cleaning / inspection.

ix) Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.

x) Don't allow unauthorised person to stand under the concreting area.

xi) Ensure adequate lighting arrangements for carrying out concrete work during night.

xii) Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.

xiii) During pouring, shuttering and its supports should be continuously watched for defects.

xiv) Never look into the drum mounted on truck (such as in case of Ready Mix Concrete).

6.4 ROAD WORK

6.4.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion. This should be done sufficiently advance as a warning to the approaching drivers for the impending dander ahead.

6.4.2 Filled and empty bitumen drums shall be stacked separately at designated places.

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6.4.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.

6.4.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.

6.4.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.

6.4.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal sheet, to prevent anything falling in it,

6.4.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.

6.4.8 For cement concrete roads, besides site barricading and installation of warning signs for traffic diversion, safe practices mentioned in the chapter on "Concreting", shall also be applicable.

6.4.9 Any excavation for road work should be done only after surveying underground utilities and after taking suitable precautions. The underground utilities to be rerouted as required after approval of competent person / authority.

6.4.10 All the raw material for road construction/ maintenance to be stored on designated place which should be away from the running road. The running road should not be used for storing the sand, hot bitumen, etc..

6.4.11 Precaution should be taken that no construction material/ slab/ pre-fabricated object can come on the running road accidently or due to slipping. In such case, an erection plan should be designed and got approved from the competent authority.

6.5 CUTTING / WELDING

6.5.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks , depletion in O_2 concentration due to generation of toxic gases, etc. Following precautions should be taken: -

i) A dry chemical powder (DCP) type fire extinguisher shall be made available in the work area.

ii) Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.

iii) Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used. Also their regular calibration where ever necessary.

iv) All panels and covers shall be kept in place, when operating an electric Arc welding machine. 30mA rating ELCB shall be ensured in the power receptacle of the welding machine.

v) The work piece should be connected directly to Power supply, and not indirectly through pipelines/ structures/ equipment etc.

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vi) The welding receptacles shall be rated for 63 A suitable for 415V, 3-Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.

vii) All cables, including welding and ground cables shall be checked for any worn out or cracked insulation before starting the job and such cables shall not be used. Ground cable should be separate without any loose joints.

viii) Cable coiling shall be maintained at minimum level, if not avoidable. Criss-crossing of welding/electrical power supply cables & gas cutting hoses shall be avoided. Care to be taken against damage of gas cutting hoses.

ix) An energised electrode shall not be left unattended.

x) The power source shall be turned off at the end of job.

xi) All gas cylinders shall be properly secured in upright position.

xii) Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.

xiii) Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.

xiv) When not in use, valves of all cylinders shall be kept closed.

xv) All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.

xvi) Forced opening of any cylinder valve should not be attempted.

xvii) Lighted gas torch shall never be left unattended.

xviii) Store acetylene and oxygen cylinders separately.

xix) Store full and empty cylinders separately.

xx) Avoid cylinders coming into contact with heat.

xxi) Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.

xxii) If cylinders have to be moved, be sure that the cylinder valves are shut off.

xxiii) Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.

xxiv) Do not use matches to light torches, use a friction lighter. Gas torch should be ignited with the lighter only. It should not be ignited by touching other hot surfaces.

xxv) Move out any leaking cylinder immediately and cap it. No hot work should be permitted in the vicinity of such leaked cylinders.

xxvi) Use trolleys for oxygen & acetylene cylinder and chain them.

xxvii) Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.

xxviii) Ensure that hoses are free from burns, cuts and cracks and properly clamped.

xxix) Avoid dragging hoses over sharp edges and objects

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xxx) Do not wrap hoses around cylinders when in use or stored.

xxxi) Protect hoses from flying sparks, hot slag, and other hot objects. Protect cylinders by covering welding blanket while hot work in the vicinity.

xxxii) Lubricants shall not be used on Ox-fuel gas equipment.

xxxiii) During cutting/welding, use required PPEs like hand gloves, full body clothing of fire retardant / suitable material, safety shoes, full body safety harness, mask, goggles / face shields, welding screen of required DIN glass as per approved Weld Preparation Scheme.

xxxiv) Hot work permit to be taken if working in hazardous area.

6.6 WORKING IN CONFINED SPACES

6.6.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.

i) Shut down, positively isolate, depressurise and purge the vessel as per laid down procedures.

ii) Entry inside the vessel to carry out any job shall be done after issuance of valid permit only in line with the requirement of OISD-STD-105.

iii) Ensure proper and accessible means of exit before entry inside a confined space.

iv) The number of persons allowed inside the vessel should be limited to avoid overcrowding. Record of entering person shall be maintained with in and out time.

v) When the work is going on in the confined space, there should always be two men standby at the nearby manway / manhole equipped with communication arrangement to contact seniors and to evacuate the worker inside confined space in case of emergency.

vi) Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel and corrective action should be ensured.

vii) Ensure requisite O_2 level before entry in the confined space and monitor level periodically or other wise use required respiratory devices.

viii) Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.

ix) Ensure adequate ventilation or use respiratory devices.

x) Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, required respiratory device, shall be used by everyone while entering.

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xi) Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.

xii) Use 24V flameproof lamp fittings only for illumination.

xiii) Use tools with air motors or electric tools with maximum voltage of 24V.

xiv) House keeping shall be well maintained.

xv) Required PPEs like Safety helmet, safety shoes and full body harness shall be worn by everyone entering the confined space.

xvi) Don't wear loose clothing while working in a confined space.

xvii) In case of the vessels which are likely to contain pyropheric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyropheric substances. Otherwise, these should be always kept wet by suitable means.

xviii) The cutting torches should also be kept outside the vessel immediately after the cutting.

xix) The gas cylinders used for cutting/welding shall be kept outside. Care to be taken for the integrity of gas hoses and welding cables while work is in progress.

xx) All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.

xxi) To the extent possible sludge shall be cleared and removed from outside before entering.

xxii) No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.

xxiii) Communication should be always maintained between the worker and the attendant.

xxiv) Inside the confined space spray painting should be avoided. If absolutely essential it should be done after ensuring adequate precautions including exhaust of paint vapours and continuous monitoring of concentration of oxygen and toxic gases.

xxv) Before issuing the vessel entry permit, it should be ensured that all the incoming and outgoing lines to and from the vessel are positively isolated. Where this is not applicable like dampers in HRSG system, Sufficient time is to be allowed to observe the leakage of hot gases from the dampers/ passing valves before taking any decision on vessel entry permit.

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6.7 PROOF/PRESSURE TESTING

6.7.1 Review test procedure before allowing testing with water or air or any other fluid. Testing should be done only after proper Job Safety Analysis (JSA) and its approval.

6.7.2 Provide relief valves of adequate size while testing with air or other gases.

6.7.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.

6.7.4 Inform all concerned in advance of the testing.

6.7.5 Keep the vents open before opening any valve for filling/draining of liquid used for hydrotesting. The filling/draining should not exceed the designed rate for pressure testing.

6.7.6 Provide separate gauges of suitable range for pressurising pump and the equipment to be tested.

6.7.7 Provide gauges at designated locations for monitoring of pressures.

6.7.8 Check the calibration of all pressurising equipment and accessories and maintain records.

6.7.9 Take readings at pre-defined intervals.

6.7.10 Arrangement to be made to ensure that the pressurizing system i.e. motor-pump set is out of circuit so that the system under hydro testing is not re-pressurized by the contractor due to pressure drop before a pre-defined time.

6.8 WORKING AT HEIGHTS

6.8.1 General Provision

i) While working at a height of more than 2.2 meters, ISI approved full body harness shall be used.

ii) While working at a height of more than 2.2 meters, permit should be issued by competent person before commencement of the job.

iii) Worker should be well trained on usage of full body harness including its proper usage at the time of ascending/descending.

iv) All tools should be carried in tool bag/belt to avoid their falling.

v) If the job is on fragile/sloping roof, roof walk ladders shall be used.

vi) Provide lifeline properly designed, secured and anchored, wherever required. Mock Drill of use of lifeline at regular intervals to be carried out.

vii) Additional safety measures like providing Fall Arrestor type full body harness, safety net should be provided depending upon site conditions, job requirements.

viii) Keep working area neat and clean. Remove scrap material immediately.

ix) Don't throw or drop material/equipment from height.

x) Avoid jumping from one member to another. Use proper passageway.

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xi) Keep both hands free while climbing. Don't try to bypass the steps of the ladder. Same to be followed while climbing down. Further on climbing down, front of the body to be towards the ladder.

xii) Try to maintain calm at height. Avoid over exertion.

xiii) Avoid movements on any structural member without fall protection.

xiv) Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

xv) Fall protection hierarchy to be followed as below:

(a) Elimination: Explore possibility whether job can be done avoiding work at height.

(b) Prevention: Prevent fall of a worker by providing appropriate fall prevention system.

(c) Fall arrest system: Arrest the fall using suitable fall arrest system. Ensure to have a strong suitably designed anchor point.

(d) Warning Lines: Use a warning line using a rope or wire barrier around roof to warn workers that they are getting close to the roof edge.

(e) Safety Monitoring: Use a safety monitor to warn the workers.

(f) Administration: Prepare a written administrative procedure to ensure workers are doing the best that they can.

6.8.2 Roof Work

i) All roof-work operations should be pre-planned and properly supervised.

ii) Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.

iii) Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.

iv) Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.

v) Roofing brackets should fit the slope of the roof and be securely supported.

vi) Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.

vii) On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.

viii) All covers for openings in roofs should be of substantial construction and be secured in position.

ix) Roofs with a pitch of more than 10 should be treated as sloping.

x) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.

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xi) During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off the roof.

xii) Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.

xiii) A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

6.8.3 Work on tall chimneys

i) For the erection and repair of tall chimneys, scaffolding should be provided. A safety net should be maintained at a suitable distance below the scaffold.

ii) The scaffold floor should always be at least 65 cm below the top of the chimney.

iii) Under the working floor of the scaffolding the next lower floor should be left in position as a catch platform.

iv) The distance between the inside edge of the scaffold and the wall of the chimney should not exceed 20 cm at any point.

v) Catch platforms should be erected over:

(a) the entrance to the chimney;
(b) Passageways and working places where workers could be endangered by falling objects.

vi) For climbing tall chimneys, access should be provided by:

(a) stairs or ladders;
(b) a column of iron rungs securely embedded in the chimney wall;
(c) Other appropriate means.

vii) When workers use the outside rungs to climb the chimney, a securely fastened steel core rope looped at the free end and hanging down at least 3 m should be provided at the top to help the workers to climb on to the chimney.

viii) While work is being done on independent chimneys the area surrounding the chimney should be enclosed by fencing at a safe distance.

ix) Workers employed on the construction, alteration, maintenance or repair of tall chimneys should not:

a) work on the outside without a safety harness attached by a lifeline to a rung, ring or other secure anchorage;
b) put tools between the safety harness and the body or in pockets not intended for the purpose;
c) haul heavy materials or equipment up and down by hand to or from the workplace on the chimney;
d) fasten pulleys or scaffolding to reinforcing rings without first verifying their stability;
e) work alone;

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f) climb a chimney that is not provided with securely anchored ladders or rungs;
g) Work on chimneys in use unless the necessary precautions to avoid danger from smoke and gases have been taken. Ensure that the outside surface temperature of the chimney is at
h) room temperature before taking up any job after shut down of the (system) chimney.

x) Work on independent chimneys should not be carried on in high winds, icy conditions, fog or during electrical storms.

6.9 HANDLING AND LIFTING EQUIPMENT:

6.9.1 General Provisions

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

i) There should be a well-planned safety programme to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;

ii) All lifting appliances shall be examined by competent persons at frequencies as specified in "The Factories act".

iii) Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.

iv) Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.

v) Check periodically the oil, brakes, gears, horns and tyre pressure, lighting fixtures of all moving equipments like cranes, forklifts, trailers, etc. as per manufacturer's recommendations.

vi) Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.

vii) Allow lifting slings as short as possible and check packing at the friction points.

viii) While lifting/placing of the load, no unauthorised person shall remain within the radius of the boom and underneath the load.

ix) While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.

x) Control longer jobs being lifted up from both ends.

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xi) Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.

xii) During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.

xiii) Allow crane to move on hard, firm and leveled ground. Ensure that all the crane pedestals/ hydraulic jacks taking weight of the crane and load are on a firm compacted surface.

xiv) When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.

xv) Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.

xvi) Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.

xvii) No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.

6.9.2 Hoists

i) Hoist shafts should be enclosed with rigid panels or other adequate fencing at:

(a) ground level on all sides;
(b) all other levels at all points at which access is provided;
(c) all points at which persons are liable to be struck by any moving part.

ii) The enclosure of hoist shafts, except at approaches should extend where practicable at least 2 meters above the floor, platform or other place to which access is provided except where a lesser height is sufficient to prevent any person falling down the hoistway and there is no risk of any person coming into contact with any moving part of the hoist, but in no case should the enclosure be less than 1 meter in height.

iii) The guides of hoist platforms should offer sufficient resistance to bending and, in the case of jamming by a safety catch, to buckling.

iv) Where necessary to prevent danger, adequate covering should be provided above the top of hoist shafts to prevent material falling down them.

v) Outdoor hoist towers should be erected on firm foundations, and securely braced, guyed and anchored.

vi) A ladderway should extend from the bottom to the top of outdoor hoist towers, if no other ladderway exists within easy reach.

vii) Hoisting engines should be of ample capacity to control the heaviest load that they will have to move.

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viii) Hoists should be provided with devices that stop the hoisting engine as soon as the platform reaches its highest stopping place.

ix) Winches should be so constructed that the brake is applied when the control handle is not held in the operating position.

x) It should not be possible to set in motion from the platform a hoist, which is not designed for the conveyance of persons.

xi) Winches should not be fitted with pawl and ratchet gears on which the pawl must be disengaged before the platform is lowered.

xii) Hoist platforms should be capable of supporting the maximum load that they will have to carry with a safety factor.

xiii) Hoist platforms should be equipped with safety gear that will hold the platform with the maximum load if the hoisting rope breaks.

xiv) If workers have to enter the cage or go on the platform at landings there should be a locking arrangement preventing the cage or platform from moving while any worker is in or on it.

xv) On sides not used for loading and unloading, hoist platforms should be provided with toe-boards and enclosures of wire mesh or other suitable material to prevent the fall of parts of loads.

xvi) Where necessary to prevent danger from falling objects, hoist platforms should be provided with adequate covering.

xvii) Counterweights consisting of an assemblage of several parts should be made of specially constructed parts rigidly connected together.

xviii) Counterweights should run in guides.

xix) Platforms should be provided at all landings used by workers.

xx) Following notices should be posted up conspicuously and in very legible characters:

(a) on all hoists:

- on the platform: the carrying capacity in kilograms or other appropriate standard unit of weight;
- on the hoisting engine: the lifting capacity in kilograms or other appropriate standard unit of weight;

(b) on hoists authorised or certified for the conveyance of persons:

- on the platform or cage: the maximum number of persons to be carried at one time;

(c) on hoists for goods only:

- on every approach to the hoist and on the platform: prohibition of use by persons.

xxi) Hoists intended for the carriage of persons should be provided with a cage so constructed as to prevent any person from falling out or being trapped between the cage and any fixed part of the structure when the cage gate is shut, or from being struck by the counterbalance weight or by articles or materials tailing down the hoistway.

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xxii) On each side in which access is provided, the cage should have a gate fitted with devices which ensure that the gate cannot be opened except when the cage is at a landing and that the gate must be closed before the cage can move away from the landing.

xxiii) Every gate in the enclosure of the hoist shaft which gives access from a landing place to the cage should be fitted with devices to ensure that the gate cannot be opened except when the cage is at that landing place, and that the cage cannot be moved away from that landing place until the gate is closed.

6.9.3 Derricks

Stiff-leg derricks

i) Derricks should be erected on a firm base capable of taking the combined weight of the crane structure and maximum rated load.

ii) Devices should be used to prevent masts from lifting out of their seating.

iii) Electrically operated derricks should be effectively earthed from the sole plate or framework.

iv) Counterweights should be so arranged that they do not subject the backstays, sleepers or pivots to excessive strain.

v) When derricks are mounted on wheels:

a) a rigid member should be used to maintain the correct distance between the wheels;
b) they should be equipped with struts to prevent them from dropping if a wheel breaks or the derrick is derailed.

vi) The length of a derrick jib should not be altered without consulting the manufacturer.

vii) The jib of a scotch derrick crane should not be erected within the backstays of the crane.

Guy derricks

i) The restraint of the guy ropes should be ensured by fitting stirrups or anchor plates in concrete foundations.

ii) The mast of guy derricks should be supported by six top guys spaced approximately equally.

iii) The spread of the guys of a guy derrick crane from the mast should not be more than 45^0 from the horizontal.

iv) Guy ropes of derricks should be equipped with a stretching screw or turnbuckle or other device to regulate the tension.

v) Gudgeon pins, sheave pins and fool bearings should be lubricated frequently.

vi) When a derrick is not in use, the boom should be anchored to prevent it from swinging.

6.9.4 Gin poles

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i) Gin poles should:

(a) be straight;
(b) consist of steel or other suitable metal;
(c) be adequately guyed and anchored;
(d) be vertical or raked slightly towards the load;
(e) be of adequate strength for the loads that they will be required to lift/move.

ii) Gin poles should not be spliced and if a gin pole is composed of different elements, they should be assembled in conformity with their intrinsic material strength.

iii) Gin poles should be fastened at their feet to prevent displacement in operation.

iv) Gin poles, which are moved from place to place and re-erected, should not be taken into use again before the pole, lifting ropes, guys, blocks and other parts have been inspected, and the whole appliance has been tested under load.

v) When platforms or skips are hoisted by gin poles, precautions should be taken to prevent them from spinning and to provide for proper landing.

6.9.5 Tower cranes

i) Where tower cranes have cabs at high level, persons, capable and trained to work at heights, should only be employed as crane operators.

ii) The characteristics of the various machines available should be considered against the operating requirements and the surroundings in which the crane will operate before a particular type of crane is selected.

iii) Care should be taken in the assessment of wind loads both during operations and out of service. Account should also be taken of the effects of high structures on wind forces in the vicinity of the crane.

iv) The ground on which the tower crane stands should have the requisite bearing capacity. Account should be taken of seasonal variations in ground conditions.

v) Bases for tower cranes and tracks for rail-mounted tower cranes should be firm and level. Tower cranes should only operate on gradients within limits specified by the manufacturer. Tower cranes should only be erected at a safe distance from excavations and ditches.

vi) Tower cranes should be sited where there is clear space available for erection, operation and dismantling. As far as possible, cranes should be sited so that loads do not have to be handled over occupied premises, over public thoroughfares, other construction works and railways or near power cables.

vii) Where two or more tower cranes are sited in positions where their jibs could touch any part of the other crane, there should be direct means of communication between them and a distinct warning system operated from the cab so that one driver may alert the other of impending danger.

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viii) The manufacturers' instructions on the methods and sequence of erection and dismantling should be followed. The crane should be tested before being taken into use.

ix) The climbing operation of climbing tower cranes should be carried out in accordance with manufacturers' instructions. The free-standing height of the tower crane should not extend beyond what is safe and permissible in the manufacturers' instructions.

x) When the tower crane is left unattended, loads should be removed from the hook, the hook raised, the power switched off and the boom brought to the horizontal. For longer periods or at times when adverse weather conditions are expected, out of service procedures should be followed. The main jib should be slewed to the side of the tower away from the wind, put into free slew and the crane immobilised.

xi) A windspeed measuring device should be provided at an elevated position on the tower crane with the indicator fitted in the drivers' cab.

xii) Devices should be provided to prevent loads being moved to a point where the corresponding safe working load of the crane would be exceeded. Name boards or other items liable to catch the wind should not be mounted on a tower crane other than in accordance with the manufacturers' instructions.

xiii) Tower cranes should not be used for magnet, or demolition ball service, piling operations or other duties, which could impose excessive loading on the crane structure.

6.9.6 Lifting ropes

i) Only ropes with a known safe working capacity should be used as lifting ropes.

ii) Lifting ropes should be installed, maintained and inspected in accordance with manufacturers' instructions.

iii) Repaired steel ropes should not be used on hoists.

iv) Where multiple independent ropes are used, for the purpose of stability, to lift a work platform, each rope should be capable of carrying the load independently.

6.10 VEHICLE MOVEMENT

6.10.1 Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.

6.10.2 Don't overload the vehicle.

6.10.3 Obey speed limits and traffic rules.

6.10.4 Always expect the unexpected and be a defensive driver.

6.10.5 Drive carefully during adverse weather and road conditions.

6.10.6 Read the road ahead and ride to the left.

6.10.7 Be extra cautious at nights. Keep wind screens clean and lights in working condition.

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6.10.8 All vehicles used for carrying workers and construction materials must undergo predictive/preventive maintenance and daily checks

6.10.9 Driver with proper valid driving license shall only be allowed to drive the vehicle

6.10.10 Routes shall be leveled marked and planned in such a way so as to avoid potential hazards such as overhead power lines and sloping ground etc.

6.10.11 While reversing the vehicles, help of another worker should be ensured at all times

6.10.12 An unattended vehicle should have the engine switched off

6.10.13 Wherever possible one-way system shall be followed

6.10.14 Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle

6.10.15 Load should be properly secured

6.10.16 The body of the tipper lorry should always be lowered before driving the vehicle off.

6.10.17 Signs/signals/caution boards etc. should be provided on routes.

6.10.18 All vehicles in a running process plants to use spark arrester on the exhaust.

6.10.19 No material should be protruding outside the vehicle for the safety of the public. If necessary, same to be marked as per RTO regulations.

6.10.20 Proper caution tag should be available on the vehicle for hazardous material like oil,.LPG, explosives, nuclear material, toxic fluids etc and the vehicle staff should be well informed about the potential danger of the material being transported by them.

6.10.21 An earth chain for the discharge of static electricity generated during transportation of specific material with the vehicle to be provided.

6.10.22 Drunken driving should be prohibited.

6.11 ELECTRICAL

6.11.1 General Provisions

i) Only persons having valid licenses shall be allowed to work on electrical facilities as per prevailing IE Act and rules thereunder including CEA rules/regulations.

ii) No person should be allowed to work on live circuit. The same, if unavoidable, special care and written authorisation need to be taken.

iii) Treat all circuits as "LIVE" unless ensured otherwise.

iv) Electrical " Lock Out - Tag Out (LOTO)" procedure "MUST" be followed for work on electrical system.

v) Display voltage ratings prominently with "Danger" signs in local language also.

vi) Put caution/notice signs before starting the repair works.

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vii) All electrical equipment operating above 250V shall have two separate and distinct connections to earth grid.

viii) Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.

ix) Make sure that electrical switch boards, portable tools, equipment (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry, check for specified insulation value and then only use them. Check proper earthing.

All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.

x) Don't work wet on electrical system.

xi) Don't overload the electrical system.

xii) Use only proper rated HRC fuses / ELCB / MCB.

xiii) Only ISI marked or equivalent industrial type extension boards and Plug sockets are to be used.

xiv) ELCB for all temporary connections must be provided using 3 pin plug.

xv) All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.

xvi) All Power cables to be properly terminated using glands and lugs of proper size, type and crimped.

xvii) Use electrical fittings in Hazard zones as per area classification under OISD-STD-113.

xviii) Ensure pipe sleeve / conduit to protect underground cables at crossings.

xix) Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.

xx) Maintain safe overhead distance of HT transmission lines as per latest CEA Safety Regulation.

xxi) Don't use pipelines/structures for earthing.

xxii) Don't make any unsafe temporary connections, e.g. naked joints etc.

xxiii) Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.

xxiv) Check at periodic intervals that pins of sockets and joints are not loose.

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xxv) Protect electrical wires/equipment from water and naked flames.

xxvi) Illuminate level in all the work areas should be in line with OISD-RP-149.

xxvii) All switchboards should be of MS structure only and incoming/outgoing feeders should be marked.

xxviii) Hand lamps/ Torch should not be of more than 24V rating, and E'x' type should be in line with hazardous area classification.

xxix) Fire extinguishers (DCP/CO_2/Sand buckets) should be kept near temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.

xxx) ISI marked Insulating mats shall be provided in the front and back end of switch boards.

xxxi) All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and explosion.

Periodic checking of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed in line with OISD-STD-137, and records to be maintained duly endorsed by the concerned.

xxxii) A notice displaying following, should be kept exhibited at suitable places in local language also:

a) prohibiting unauthorized persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;
b) containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;
c) specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.

xxxiii) No other cables/pipes to be laid in trench used for electrical cables.

xxxiv) Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.

xxxv) Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.

xxxvi) Flameproofness integrity of all flameproof equipment / fittings/fixtures to be ensured at all times.

NOTE: A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per latest CEA Safety Regulation.

6.11.2 Inspection and maintenance

i) All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.

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ii) At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.

iii) Apart from some exceptional cases subject to work permits, work on or near live parts of electrical equipment should be forbidden.

Before starting any work on conductors and/or equipment, it is to be ensured that: power supply should be isolated by an authorized person following the concept of LOTO;

iv) After work has been done on conductors and/or equipment, the power supply should only be switched on again after work permit is returned back, lock/tag on isolated feeder are removed and the workplace is reported safe.

v) Electricians should be provided with approved and tested tools and personal protective equipment such as rubber gloves, arc flash suit etc.

vi) All conductors and equipment should be considered to be live unless there is a proof of the contrary.

vii) When work has to be done in dangerous proximity to live parts the power supply should be cut off. If for operational reasons this is not possible, the live parts should be fenced off or enclosed by qualified staff from the sub-station concerned.

6.11.3. Testing

i) Electrical installations should be inspected and tested as per approved plan and the results recorded.

ii) Periodic testing for proper functioning of the earth leakage protective devices should be carried out.

iii) Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

6.12 OFFSHORE

6.12.1 General

The isolated nature of offshore installations are hazardous. They call for greater need for health safety and survival at offshore. Safety at offshore is safety of installations and safety of personnel. Safety problems and accidents at offshore have high risks due to limited space, helicopter operation, sea transport etc. Following are the general health and safety guidelines to be followed in addition to the safety guidelines stipulated for specific jobs dealt later on:

i) Workers should be well trained to do their job independently with high degree of self-control and self-discipline.

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ii) On arrival at offshore, everyone should be briefed about the safety rules to be followed at offshore, evacuation system etc. All personnel should wear overall (dangri), helmet and shoes for personnel protection.

iii) In case of emergency, workers should follow instruction of Field Production Superintendent (F.P.S.). In certain cases instructions may be given to abandon the offshore installation and evacuate the persons to safe location.

iv) To overcome above problems, offshore personnel must receive training for using life saving appliances and other personal survival techniques.

v) Any person working at offshore should have one person as standby for any eventuality.

vi) Periodical health check-up of all personal on platforms shall be ensured and remedial measures shall be taken as per statutory and other requirements.

6.12.2 Drilling Rigs

i) Location of jack up rigs should not be less than 5 Kms from shipping route. Orientation of the rig, wind direction, etc. are required for safe landing of helicopter. Information w.r.t. sea currents, wind speed, Hi- Low tide, etc. are required for mooring of supply vessels.

ii) Sea bed condition at every location should be ensured for safety of rig.

iii) Radio and other communication facilities should be such to maintain contact with base all times.

iv) During toeing of rig, the rig deck should be clear of load, toeing lines should be in good condition and tensions in various toeing lines should be constantly monitored.

v) Few steps during toeing are:

a) crane booms should be secured to their vesta,
b) all hatches and water tight doors should be closed,
c) number of personnel on board should be restricted,
d) evacuate in case of emergency and operation should be completed preferably in day light.

6.12.3 Drilling

i) In view of CO_2 and H_2S gas cut from well, effective ventilation should be provided where drilling is in progress.

ii) Safety alarm shall be checked in advance in view of failure of ventilation system.

iii) Suitable sensors for H_2S and Methane should be function tested time to time and suitable colour code should be given.

iv) Working areas of the crane should be illuminated during night to avoid accident.

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v) Clear space should be available for despatch and receipt of load and, in particular, basket transfer of passengers. Persons engaged in loading/unloading of materials should be protected from falling into the sea.

vi) Signal light should be fitted at the top of the jib.

vii) Crane hook should be fitted with safety latches.

viii) Experienced person should be engaged in operation of specific equipment like winches, cranes etc.

ix) At least three cable turns shall always be there on the winch drum.

x) Adequate communication like walkie talkie, round robin phone should be available between the crane operator, supervisor and helper.

xi) Crane operation should be completely stopped during helicopter landing/ taking off.

xii) Except for helicopter landing deck, all decks, platforms, bridges, ladders should have rigid and fixed guard rails atleast one meter high and should have one intermediate rail midway between the handrail and 100 mm toe board.

xiii) Wooden ladders shall not be used at offshore.

xiv) Flow sensor in the flow line should be ensured for safe working and to avoid blow out.

xv) Hydrogen sulphuide gas In offshore is of great risk and at 10 ppm (0.001%) concentration in air, a person should not be exposed for more than 8 hours, If concentration is more, then breathing apparatus should be used. Corrosion of equipment is also caused by H_2S.

xvi) Portable H_2S gas detector should be continously used.

6.12.4 Production Platforms

i) In case hydrocarbon Is released due to overpressure, leak, overflow, gas blow etc., shut down process to stop flow *of* hydrocarbon. Prevent ignition of released hydrocarbon and in case of fire shut in the process complex and follow emergency contigency plan.

ii) Sub surface safetv valve (SSSV)) below the well head should be actuated during uncontrolled well -flow and they should be regularly checked.

iii) Surface safety valve or SDV should be checked for no gas leakage from bleed port / flange etc., in the well head area. It should not be in "mechanical override" or bypassed from panel.

iv) High pressure gas lift lines - blowdown system should be O.K.

* Auto actuation of SDVs in the inlet of pressure vessels should be O.K. and in "normal position" from shutdown panels. A record of status of switches normal/bypassed

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in auto-con* panels (PSH, PSL, LSL, ILSL) should be maintained.

*Shut Down Panels

v) Welders rectifier set and electrical connections to it should be checked and approved by electrical-in- charge for proper electrical safely.

vi) "SCADA" telementry system if available should be operational for remote opening and closing of wells at unmanned platforms (through RPMC).

vii) Local ESD/FSD (near the work site) should be provided for jobs of very critical nature, so that the persons working can access it immediately in emergency for safety. Safety officer should judge the requirement & inform FPS for the same.

viii) Railings and Gratings etc. in and around work area should be O.K. and inspected to avoid slippage of man into sea.

ix) Emergency Shut Down (ESD) system is initiated when an abnormal condition is detected. ESD should be checked once in six months.

x) Platform should be manned round the clock.

xi) Welding and cutting work should be regulated by hot work permit.

xii) All detectors should be calibrated as per recommendation of the manufacturer.

xiii) No system should be by-passed which affects the system of platform.

xiv) In H_2S field platforms, due care shall be taken as per recommendations.

xv) Follow the instructions of F.P.S. during stay at platform

6.12.5 Fire Prevention And Control

i) Provision be made for safe handling and storage of dirty rags, trash, and waste oil. Flammable liquids and chemicals applied on platform should be immediately cleaned.

ii) Paint containers and hydrocarbon samples, gas cylinders for welding and cutting should be stored properly. Cylinders should be transported in hand-cart.

iii) Smoking should be restricted and no smoking area should be identified.

iv) Special attention should be given to crude oil pump seals; diesel and gas engines which are potential source of ignition in the event of failure.

v) Fire and smoke detectors i.e. ultraviolet heat, thermal and smoke detector should be function tested once in three months.

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vi) Fire is controlled in offshore by water spraying, Halon, CO_2 flooding, DCP and sprinkler system.

vii) Foaming agent is applied for controlling fire in liquid hydrocarbon. The system is not effective in gas fire.

viii) Light weight breathing system should be used.

ix) The fire control plan at offshore should reveal control station, fire alarms and fire detectors, deluge valves and sprinkler, fire extinguishing appliances, fireman outfit and ventilation system.

x) Fire fighting equipment should be maintained in ready to use condition.

6.12.6 Life Saving Appliances

i) Life boats with a speed of 6 knots and carrying capacity upto 50 persons are used in offshore.

ii) No. of life boats on one installation should have a capacity to accommodate twice the number of persons onboard installation.

iii) Launching appliances and life boat equipment should be checked every week.

iv) Boat landing areas should be adequately illuminated.

v) Life raft has no power and they rely on drift.

vi) Life jacket lifts the wearer after entering water.

vii) Life buoys are used to rescue persons if any person accidentally falls in the sea.

viii) All life saving appliances should be inspected by the MMD surveyor /sr. officials once a year.

ix) Every life boat shall be inspected once a week.

x) Every life boat and life raft should be serviced once a year by a competent authority.

6.12.7 Safety Precautions during Helicopter Transportation

i) Passenger briefing regarding safety rules while travelling in helicopter should be carried out before boarding the helicopter.

ii) Emergency procedure should be briefed to all the passengers in case helicopter is to ditch into the sea.

iii) Heli-pad should have a non-skid surface. Nylon rope net should be stretched on the deck.

iv) Proper drainage should be available on helideck.

v) There should be no obstruction on the helideck itself and within 3 meters of its perimeter. Closest super structure above the helideck should have red obstruction light.

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vi) While landing on helicopter, fire crew of two persons should be standby adjacent to helideck.

vii) Heli-deck should be properly illuminated for night landing.

viii) During switching off helicopter, persons should not be allowed to go out/ towards helicopter

6.13 DEMOLITION

6.13.1. General provisions

i) When the demolition of any building or structure might present danger to workers or to the public:

(a) necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;
(b) the work should be planned and undertaken only under the supervision of a competent person.

ii) Before demolition operations begin:

(a) structural details and builders' drawings should be obtained wherever possible;
(b) details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;
(c) an initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;
(d) a method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;

iii) All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.

iv) If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.

v) As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.

vi) The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.

vii) Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.

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viii) The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.

ix) Care should be taken not to demolish any parts, which would destroy the stability of other parts.

x) Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.

xi) To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.

xii) Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.

xiii) Where a deliberate controlled collapse technique is to be used, expert engineering advice should be obtained, and:

(a) it should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;
(b) it should only be used on sites that are fairly level and where there is enough surrounding space for all operatives and equipment to be withdrawn to a safe distance.

xiv) When equipment such as power shovels and bulldozers are used for demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.

xv) If a swinging weight is used for demolition, a safety zone having a width of at least one-and-a-half times the height of the building or structure should be maintained around the points of impact.

6.13.2. Demolition of structural steelwork

i) All precautions should be taken to prevent danger from any sudden twist, spring or collapse of steelwork, ironwork or reinforced concrete when it is cut or released.

ii) Steel construction should be demolished tier by tier.

iii) Structural steel parts should be lowered and not dropped from a height.

6.14 RADIOGRAPHY

6.14.1 All radiography jobs shall be carried out as per BARC Safety Regulations

6.14.2 During field radiography, nearby area around the radiation source should be cordoned off.

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6.14.3 If the field radiography is to be done at the same location repeatedly, it is advisable to provide either a wire fencing around or a temporary brick enclosure.

6.14.4 Special permission/permit should be taken for radiography from area-in-charge.

6.14.5 As far as possible, field radiography should be done only during night time when there is little or no occupancy there.

6.14.6 Radiation warning signals should be pasted all along the cordoned off area.

6.14.7 Entry into the restricted area by unauthorised persons should be strictly prohibited during exposure.

6.14.8 The radiation level alongwith the cordon should be monitored by a suitable and well-calibrated radiation survey meter.

6.14.9 All personnel working with radiography sources should wear appropriate protective equipment and film badges issued by BARC.

6.14.10 Protection facilities such as manipulator rod, remote handling tongs, lead pots, radiation hazard placards and means of cordon off shall be available at each site.

6.14.11 The radiography source shall never be touched or handled directly with hands.

6.14.12 The package containing radiography cameras and sources should never be carried by public transport like bus, train etc.

6.14.13 Radiography sources and cameras, when not in use, should be stored inside a source pit with lock and key arrangement as approved by BARC. The storage room should preferably be located in an isolated area of minimum occupancy and radiation level outside the storage room should not exceed 0.25 mR/hr as per BARC Regulations.

6.14.14 In case of an accident (due to loss or of damage to radiography source), action should be taken in line with BARC Safety Rules/Guidelines.

6.14.15 Technologically advance methods should be preferred for reduced radiation effect wherever safety so warrants.

6.15 GRIT SHOT/ SLAG BLASTING/ SPRAY PAINTING

6.15.1 Blasting for surface preparation should be used only after approval from competent person.

6.15.2 Air Compressor used for grit/shot/slag blasting/painting should have guard and positioned away from the work place.

6.15.3 Exhaust of the prime mover, if IC engine is used, should be fitted with PESO approved spark arrester (in case of work in hazardous area) and directed away from the work place.

6.15.4 In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.

6.15.5 The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.

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6.15.6 The operator of grit/shot/slag blasting/painting should wear suitable PPE's including mask and the area should be cordoned off.

6.15.7 Adequate measures to be taken to suppress dust/spray particle.

6.15.8 When these activities are done in confined places, adequate measure to be taken including monitoring Oxygen level and ensuring proper ventilation.

6.15.9 Proper fire fighting arrangements are to be made where spray painting is in progress.

6.15.10 Some paints and their supplements are toxic also and emit offensive smell. PPE to workers should be suitable to address this issue.

6.15.11 "No Smoking Zone" boards should be displayed prominantly in paints shop/ spray paint area.

6.16 WORK ABOVE WATER

6.16.1 General Provisions

i) Where work is done over or in close proximity to water & where possibility of drowning exists, provision should be made for:
   a) preventing workers from falling into water;
   b) the rescue of workers in danger of drowning;
   c) safe and sufficient transport.
   d) deputation of lifeguards/divers.
   e) preventing of persons suffering from hydrophobia on deputation to work above water.

ii) Provisions for the safe performance of work over or in close proximity to water should include, where appropriate, the provision and use of suitable and adequate:
   a) fencing, safety nets and safety harnesses;
   b) lifebuoys, life jackets and manned boats;
   c) protection against such hazards as reptiles bushes/ polluted water and other animals.
   d) deputation of lifeguards/divers.

iii) Gangways, pontoons, bridges, footbridges and other walkways or work places over water should:
   a) possess adequate strength and stability;
   b) be sufficiently wide to allow safe movement of workers;
   c) have level surfaces free from tripping hazards;
   d) be adequately lit when natural light is insufficient;
   e) where practicable and necessary, to prevent danger, be provided with toe-boards, guard rails, hand ropes etc.
   f) be secured to prevent dislodgment by rising water or high winds;
   g) if necessary, be equipped with ladders which should be sound, of sufficient strength and length and be securely lashed to prevent slipping.

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iv) All deck openings including those for buckets should be fenced.

v) All the employees (owner, contractor and contractor workers) working above and under the water should comply with the requirements of Standards of Training, Certification and Watchkeeping 95 (STCW 95).

6.16.2 Rescue & Emergency procedures

i) Persons who work over water should be provided with some form of buoyancy aid. Life jackets should be provided for sufficient freedom of movement, have sufficient buoyancy to bring persons to the surface and keep them afloat face upwards, be easily secured to the body, be readily visible by way of self luminous paint/strip.

ii) Nobody should work alone on or above water.

iii) Each worker should be trained in the procedure to be followed in the event of an emergency.

iv) Necessary rescue arrangements like divers, rescue boats etc to be in place.

v) Persons to be trained for CPR/ Artificial resuscitation as an first aid to the rescued person.

vi) Also for off shore operations. Speed of water current and water temperature to be considered.

7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS

In addition to general safety precautions as outlined above for the activities in Clause 6.0, following additional safety precautions need to be taken for the sites within the operating area or nearby, where presence of Hydrocarbons cannot be ruled out.

i) No job shall be carried out without a valid permit. Permit should be in line with OISD-STD-105 "Work Permit System".

ii) Smoking should be prohibited in all places containing readily combustible or flammable materials and "No Smoking" notices be prominently displayed.

iii) In confined spaces and other places where flammable gases, vapours or dusts can cause danger, following measures should be taken:

(a) only approved type electrical installations and equipment, including portable lamps, should be used;
(b) there should be no naked flames or source of ignition;
(c) oily rags, waste and clothes or other substances liable to spontaneous ignition should be removed without delay to a safe place;
(d) Air operated ventilation system should be provided.

iv) Regular inspections should be made of places where there are fire risks. These include the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations.

v) Welding, flame/gas cutting and other hot work should only be done after issuance of work permit in line with the requirement of OISD-STD-105

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after appropriate precautions, as required, are taken to reduce the risk of fire. For carrying out other jobs also, OISD-STD-105 should be followed strictly.

vi) Fire-extinguishing equipment should be well maintained and inspected at suitable intervals by a competent person. Access to fire-extinguishing equipment such as hydrants, portable extinguishers and connections for hoses should be kept clear at all times.

vii) All supervisors and workers should be trained in the use of fire-extinguishing equipment, so that adequate trained personnel are readily available during all working periods.

viii) Audio means to give warning in case of fire should be provided where this is necessary to prevent danger. Such warning should be clearly audible in all parts of the site where persons are liable to work. There should be an effective evacuation plan so that all persons are evacuated.

ix) Notices should be posted at conspicuous places indicating:

(a) the nearest fire alarm;
(b) the telephone number and address of the nearest emergency services.

x) The work site shall be cleared of all combustible materials, as Sparks and molten metal coming from the welding job can easily ignite combustible materials near or below the welding site. If the combustible materials cannot be removed from the area, the same shall be properly shielded.

xi) A dry chemical type fire extinguisher (DCP) shall be made available in the work area. Also fire protection facilities like running hoses etc. as per permit should be complied with.

xii) Wherever required, welding screens shall be put up to protect other equipment in adjoining areas against flying sparks. Material used should be metal/ fire proof blanket/water curtain.

xiii) Welding or cutting of vessels/ equipments used in Hydrocarbon/ hazardous flammable chemicals shall be done after ensuring hydrocarbon free area and verifying the same with the suitable hydrocarbon detector.

xiv) The confined space/equipment shall be made gas free (hydrocarbon and toxic) and cleaned and shall be ensured, with the help of suitable gas detectors.

xv) Used and hot electrode stubs shall be discarded in a metal bucket.

xvi) Use PESO approved and certified spark arrestors for vehicles, wherever applicable.

xvii) Relevant work permit (hot work, cold work, vessel entry etc. as the case maybe) to be obtained, if construction work is carried out within existing operating area.

xviii) Precaution against pyrophoric material shall be ensured.

8.0 Environment Protection

8.1 Waste

The contractor is required to develop, institute and maintain a Waste Management Programme (WMP) during the construction of the project for his works and obtain approval of the owner. WMP may include: -

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i) Identification of disposal sites.
ii) Identification of waste/surplus quantities to be disposed off.
iii) Identification of amounts intended to be stored temporarily on site location of such storage.
iv) Use of proper PPEs.
v) Identification of intended transport means and route.
vi) Obtaining permission, where required, for disposal.

Such a mechanism is intended to ensure that the designation of areas for the segregation and temporary storage of reusable and recyclable materials are incorporate into the WMP. The WMP should be prepared and submitted to the Engineer for approval.

The Contractor shall handle waste in a manner that ensures they are held securely without loss or leakage thus minimizing potential for pollution and fire. The Contractor shall maintain and clean waste storage areas regularly.

The Contractor shall make arrangement to stack the metal scrap at designated location and maintain the site free from obstruction. The scrap to be disposed as per owner instruction at regular interval.

8.2 Hazardous Waste Management

If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989, and amendments thereunder time to time" shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

Chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 of Environment (Protection) Act, 1986 (latest) shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

8.3 Air Quality

The Contractor shall take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer.

The Contractor shall use construction equipment designed and equipped to minimise or control air pollution. He shall maintain evidence of such design and equipment and make these available for inspection by Employer.

If after commencement of construction activity, Employer believes that the contractor's equipment or methods of working are causing unacceptable air pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer and implemented.

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The Contractor shall maintain the MSDS of the chemicals used / stacked at site and same shall be handled as per the standard prescribed procedure. The quantity shall be stored strictly as per the norms and emergency handling procedure shall be known and displayed prominently.

8.4 Noise

The Contractor shall consider noise as an environmental constraint in his design, planning and execution of the Works and provide demonstrable evidence of the same. The Contractor shall, take all appropriate measures to ensure that work carried out by the Contractor, whether on or off the Site, will not cause any unnecessary or excessive noise.

8.5 Occupational Noise

i) Protection against the effects of occupational noise exposure should be provided when the sound levels exceed the threshold values as prescribed.
ii) When employees are subjected to expose the sound levels beyond the prescribed limit, feasible administrative or engineering controls should be ensured.
iii) If such controls fail to reduce sound levels within the levels, personal protective equipment shall be provided and used to reduce sound levels within the prescribed limit.

9.0 OCCUPATIONAL HEALTH

9.1 Medical Examination

The contractor shall arrange a medical examination of all his employees before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, at periodicity stipulated under Factories Act / Building & Construction Workers Regulation (BOCWR).

The Contractor shall maintain the confidential records of medical examination by the physician authorized by the Employer.

9.2 Occupational Health Centre

The contractor shall ensure at a construction site an occupational health centre, mobile or static is provided and maintained in good order. Services and facilities as per the scale lay down under Factories Act / Building & Construction Workers Regulation (BOCWR). A construction medical officer appointed in an occupational health centre possess the qualification as laid down under Factories Act / Building & Construction Workers Regulation (BOCWR).

9.3 First Aid

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First aid facilities should be provided in line with various statutory regulations like The Factory Act etc. However following care should be taken:

i) First aid, including the provision of trained personnel should be ensured at work sites. Arrangement should be made for ensuring the medical attention of the injured workers.

ii) Suitable rescue equipment, like stretchers should be kept readily available at the construction site.

iii) First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.

iv) First-aid kit or boxes should not contain anything besides material for first aid in emergencies.

v) First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and replenished.

vi) Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life saving techniques as specified in rescue procedures.

vii) Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

10.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s). All accidents should be reported as per OISD Guidelines and The Factories Act, 1948/ BOCWR.

All accidents (major, minor or near miss) should be investigated, analysed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

11.0 SAFETY AWARENESS & TRAINING

Safety awareness to all section of personnel ranging from site-in-charge to workmen helps not only preventing the risk but also build up the confidence. Time and expenditures also get saved as a result.

Safety awareness basically seeks to persuade/inform people on safety besides supplementing skill also. Awareness programme may include followings:

i) **Poster:** Posters with safety slogan in humorous, gruesome demonstrating manner may be used to discourage bad habits attributable to accidents by appealing to the workers' pride, self-love, affection curiosity or human aspects. These should be displayed in prominent location(s).

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ii) **Safety Sign Boards**: Different type of message of cautioning, attention, notice etc. should be displayed at the appropriate places for learning/ awareness of the workmen while working at site.

iii) **Films & Slides:** Film(s) narrating the accident case study including the causes and possible remedial ways of preventing the recurrence of a similar accident should be displayed at regular intervals. Slides consisting main points of the film show may also be shown to workers.

iv) **Talks, lectures & conferences:** The success of these events would depend much on audience's understandings of the speaker (s). The speakers are to be knowledgeable and good presenter. Speakers should know to hold the attention and to influence the audiences.

v) **Competitions:** Organise competition(s) between the different deptts/categories of workers. The sense of reward/recognition also will improve safety awareness and result in enhancing safety levels.

vi) **Exhibitions:** Exhibitions also make the workers acquainted with hazards and means of preventive measures.

vii) **Safety Publication:** Safety publications including pocket books dealing with ways of investigation and prevention in the field of safety and so on, may be distributed to workers to promote the safety awareness.

viii) **Safety Drives:** From time to time, an intensive safety drive by organising a safety day or a safety week etc. should be launched.

ix) **Training:** Training for covering the hazards for different trade should be imparted. Training should also include the specific hazards related to a job in addition to the general safety training as has been dealt in various chapters and should include all workers. Reference may be drawn from OISD-STD-154.

12.0 REFERRENCES

i) *Factory Act, 1948*

ii) *Indian Electricity Rules*

iii) *Safety & Health in Construction by ILO*

iv) *The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996 and Central Rules 1998*

v) CSB guidelines

vi) *IS 1161: 2006 or latest edition - Steel tubes for structural purposes — specification*

vii) *IS 2750: 1964 or latest edition - Specification for steel scaffolding.*

viii) *IS : 3696 (Part 1) – 1987 (Scaffolds) Safety code of scaffolds and ladders*

ix) *IS : 3696 (Part 2) – 1987 (Ladders)Safety code of scaffolds and ladders*

x) *IS 4014 Part I: 2006 or latest edition - Code of practice for steel tubular scaffolding - definitions and materials.*

xi) *IS 4014 Part II: 2005 or latest edition - Code of practice for Steel tubular scaffolding - Safety regulations for scaffolding.*

xii) *Building & Other Construction Workers(Regulation on employment &conditions of service) central rules, 1998 (Provision related to Scaffold).*

xiii) *OHSA Standard on Scaffold (CFR 1926.452)*

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ANNEXURE I

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

Sr.no	Code No.	Title
01.	IS : 818	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
02.	IS : 875	Code of practice for Structural safety of buildings: Masonry walls
03.	IS : 933	Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
04.	IS : 1179	Specification for Equipment for Eye and Face Protection during Welding – First Revision.
05.	IS : 1904	Code of practice for Structural safety of buildings: Shallow foundations
06.	IS : 1905	Code of practice for Structural safety of buildings: Masonry walls
07.	IS : 2171	Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision.
08.	IS : 2361	Specification for Building Grips – First Revision.
09.	IS : 2750	Specification for Steel Scaffoldings.
10.	IS : 2925	Specification for Industrial Safety Helmets – First Revision.
11.	IS : 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision.
12.	IS : 3521	Industrial safety belts and harnesses
13.	IS : 3696 – Part I	Safety Code for Scaffolds and Ladders : Part I – Scaffolds.
14.	IS : 3696 – Part II	Safety Code for Scaffolds and Ladders : Part II – Ladders.
15.	IS : 3764	Safety Code for Excavation Work.
16.	IS : 4014 -Part I & II	Code of practice for Steel tubular scaffolding
17.	IS : 4081	Safety Code for Blasting and Related Drilling Operations.
18.	IS : 4082	Recommendations on staking and storage of construction materials at site
19.	IS : 4130	Safety Code for Demolition of Buildings – First Revision.
20.	IS : 4138	Safety Code Working in Compressed Air-First Revision
21.	IS : 4756	Safety code for Tunneling works
22.	IS : 4912	Safety requirements for Floor and Wall Openings, Railings and toe Boards –First Revision.
23.	IS : 5121	Safety Code for Piling and other Deep Foundations.
24.	IS : 5916	Safety Code for Construction involving use of Hot Bituminous Materials.
25.	IS : 5983	Specification for Eye Protectors – First Revision.
26.	IS : 6922	Structures subject to underground blasts, criteria for safety and design of
27.	IS : 7155	Code of recommended practices for conveyor safety
28.	IS : 7205	Safety Code for Erection on Structural Steel Works.

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Sr.no	Code No.	Title
29.	IS : 7069	Safety Code for Handling and Storage of Building Materials.
30.	IS : 7293	Safety Code for Working with Construction Machinery.
31.	IS : 7323	Guidelines for operation of Reservoirs
32.	IS : 7969	Safety code for handling and storage of building material
33.	IS : 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals.
34.	IS : 8989	Safety Code for Erection of Concrete Framed Structures.
35.	IS : 9706	Code of Practices for construction of Arial ropeways for transportation of material
36.	IS : 9759	Guidelines for de-watering during construction
37.	IS : 9944	Recommendations on safe working load for natural and man-made fibre rope slings
38.	IS : 10291	Safety code for dress divers in civil engineering works
39.	IS :10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects.
40.	IS :10386 – Part II	Safety Code for Construction, Operation and Maintenance of River Valley Projects.
41.	IS : 11057	Code of practice for Industrial safety nets
42.	IS : 13415	Code of Practice on safety for Protective barriers in and around building
43.	IS : 13416	Recommendations for preventive measures against hazards at working places

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CONTRACTOR SAFETY

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Oil Industry Safety Directorate
Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

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CIRCULATION ONLY

CONTRACTOR SAFETY

Prepared by

FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

Engineers India Ltd

OIL INDUSTRY SAFETY DIRECTORATE
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)
Website: www.oisd.gov.in
Tele: 0120-2593800, Fax: 0120-2593802

Preamble

Indian petroleum industry is the energy lifeline of the nation and its continuous performance is essential for sovereignty and prosperity of the country. As the industry essentially deals with inherently inflammable substances throughout its value chain – upstream, midstream and downstream – Safety is of paramount importance to this industry as only safe performance at all times can ensure optimum ROI of these national assets and resources including sustainability.

While statutory organizations were in place all along to oversee safety aspects of Indian petroleum industry, Oil Industry Safety Directorate (OISD) was set up in 1986 Ministry of Petroleum and Natural Gas, Government of India as a knowledge centre for formulation of constantly updated world-scale standards for design, layout and operation of various equipment, facility and activities involved in this industry. Moreover, OISD was also given responsibility of monitoring implementation status of these standards through safety audits.

In more than 25 years of its existence, OISD has developed a rigorous, multi-layer, iterative and participative process of development of standards – starting with research by in-house experts and iterating through seeking & validating inputs from all stake-holders – operators, designers, national level knowledge authorities and public at large – with a feedback loop of constant updation based on ground level experience obtained through audits, incident analysis and environment scanning.

The participative process followed in standard formulation has resulted in excellent level of compliance by the industry culminating in a safer environment in the industry. OISD – except in the Upstream Petroleum Sector – is still a regulatory (and not a statutory) body but that has not affected implementation of the OISD standards. It also goes to prove the old adage that self-regulation is the best regulation. The quality and relevance of OISD standards had been further endorsed by their adoption in various statutory rules of the land.

Petroleum industry in India is significantly globalized at present in terms of technology content requiring its operation to keep pace with the relevant world scale standards & practices. This matches the OISD philosophy of continuous improvement keeping pace with the global developments in its target environment. To this end, OISD keeps track of changes through participation as member in large number of International and national level Knowledge Organizations – both in the field of standard development and implementation & monitoring in addition to updation of internal knowledge base through continuous research and application surveillance, thereby ensuring that this OISD Standard, along with all other extant ones, remains relevant, updated and effective on a real time basis in the applicable areas.

Together we strive to achieve NIL incidents in the entire Hydrocarbon Value Chain. This, besides other issues, calls for total engagement from all levels of the stake holder organizations, which we, at OISD, fervently look forward to.

Jai Hind!!!

Executive Director
Oil Industry Safety Directorate

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FOREWORD

At the time of development of this document, 113 OISD standards, recommended practices and guidelines are applicable to the Oil and Gas installations of Public sector Oil Companies in India. 11 of these standards have been adopted by Petroleum and Explosives Safety Organisation (PESO) in various rules administered by them and thus the provisions of these standards are mandatory for entire Oil & Gas sector to that extent.

A few serious accidents have occurred in the recent past in India and abroad including vapour cloud explosion and fire at Oil terminal near Jaipur emphasised the need for the industry to review the existing provisions of various guidelines and statutory requirements.

With the above in view the Government of India directed the Oil Industry Safety directorate to develop a comprehensive document covering all the facets of Safety in Design, Operation and Maintenance, of depots and terminals being run by marketing divisions of Oil companies with an objective to strengthen the existing system.

The present guideline on "Contractor Safety" has been prepared by the functional committee based on, existing standards, guidelines & recommended practices of OISD, the recommendations arising out of recent major accidents and their analysis, the accumulated knowledge and experience of industry members in India and updation of National and International codes and practices.

The provisions of this document, if implemented objectively, may go a long way in enhancing overall safety standard and reduce accidents in Oil Installations.

Users are cautioned that no standard can be substitute to the "judgement and experience of Engineers"

This document will be reviewed periodically for improvements based on the new experiences and better understanding. Suggestions are also invited from the users after it is put into practice to improve the document further. Suggestions may be addressed to:

The Coordinator
Committee on "Contractor Safety"
Oil Industry Safety Directorate
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

This guideline in no way supercedes the statutory regulations of Chief Controller of Explosives (CCE), Factory Inspectorate or any other statutory body, which shall be followed as applicable.

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NOTE

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Though every effort has been made to assure the accuracy and reliability of the data contained in these documents, OISD hereby expressedly disclaims any liability or responsibility for loss or damage resulting from their use.

These documents are intended to supplement rather than replace the prevailing statutory requirements.

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SECOND FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

LIST OF MEMBERS

Name	Organization	Status
S/Shri		
Ashok Dashputre	Vice President, RIL	Leader
Dharmvir	Addl. Director, OISD	Member Coordinator
A K Gupta	DGM (HSE), IOCL	Member
P K Agarwal	CM (HSE), IOCL	Member
S Mukharjee	DGM (C), EIL	Member
Udoay Payyadi	Sr. Manager-Maintenance, HPCL	Member
Vijay Mohan	Addl. Director, CHT	Member
Manish Pandey	Sr. Manager (Mech), BORL	Member
B K Rabha	Dy. CE(Instrumentation), OIL	Member
Bimal Raj V L	Manager (F&S), BPCL – KR	Member
Yogesh J Nakhre	Manager-F&S, HPCL.	Member
Upinder Kumar	Petronet LNG	Member
A K Arora	Addl. Director, OISD	Member

In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this Guideline.

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FIRST FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

LIST OF MEMBERS

Name	Organization	Status
S/Shri		
R N Biswas	Indian Oil Corporation Ltd.	Leader
S K Bag	Indian Oil Corporation Ltd.	Member
K Prakash	Bharat Petroleum Corporation Ltd.	Member
A Tilwankar	Bharat Petroleum Corporation Ltd.	Member
A D Ghorpade	Hindustan Petroleum Corporation Ltd.	Member
Thomas Chacko	Kochi Refineries Ltd.	Member
R Chakravarty	Numaligarh Refineries Ltd.	Member
N R Adsul	Bharat Petroleum Corporation Ltd.	Member
M P Jain	Engineers India Ltd.	Member
C M Sharma	Oil Industry Safety Directorate	Member
A K Ranjan	Oil Industry Safety Directorate	Member Coordinator

In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this Guideline.

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CONTRACTOR SAFETY

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CONTRACTOR SAFETY

1.0 INTRODUCTION

Oil and Gas operations like Drilling, Production, Refining, Storage**,** Transportation and Distribution, etc. are inherently hazardous. A large number of contractor workforce is deployed to carry out construction, maintenance and other jobs. The analysis of the incidents in the Petroleum Sector indicates that a large number of incidents involved contractor workforce and have resulted in either casualty or injury besides leading to property damage and operational interruptions and environmental degradation.

In order to improve the safety levels of hydrocarbon installations, the contractor safety is of utmost importance and there is a need to institute a good contractor safety system.

2.0 SCOPE

This document covers broadly the guidelines on the HSE management system for enhancing the safety levels of the contractor workforce deployed in construction, maintenance and operation activities in the hydrocarbon industry.

The safety precautions to be taken while carrying out different activities during construction / maintenance have separately been covered in OISD-GDN-192 on "Safety Practices during Construction".

3.0 DEFINITIONS

Work station / Work site

A place / unit where the job is carried out by contractor/executing agency in specified manner with safety, during construction phase or in operation phase.

Owner
Any physical or legal person/entity for whom prescribed job is carried out.

It shall also include owner's designated representative / consultant /nominee / agent, authorised from time to time to act for and on its behalf, for supervising / co-ordinating the activities of the contractor/execution agency.

Contractor / Executing Agency

A physical or legal person/entity having contractual obligation with the owner, and who deploys one or more worker on the site.

Contractor Worker

It covers all workmen who are either self-employed or employed through contractor, the casual workers and includes contractor's supervisor, working at a location / site employed directly by Owner or through their contractor.

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Incident

An incident is an unplanned, uncontrolled, unintended or unforeseen event, caused by unsafe acts and / or unsafe conditions, resulting in or having the potential to result in personal injury and/or property damage.

Consultant

Consultant is a physical or legal person/entity engaged by owner to provide the consultancy services to owner for management of the contract on their behalf or as specified.

Designer

Designer is a physical or legal person / entity engaged by owner to provide design services of a work site.

Owner's Representative / Engineer In Charge

The Owner's representative/Engineer-in-charge is the one, who has been designated by the owner to manage the contract.

Owner's Safety Officer

A properly trained person designated by owner who ensures safety at work site.

4.0 DUTIES/ RESPONSIBILITIES

4.1 OWNER

4.1.1 Owner's Management

The commitment to safety has to be emphasized by the owner by practice by its own management and employees at all levels. The duties and responsibilities of owner should include:

i) To institute a mechanism for identification and compliance of all applicable statutory rules & regulations (Refer Annexure I for a list of few important Bureau of Indian Standards & statutory regulations).

ii) To provide specific information to contractors and make workers aware on the hazards associated with job assigned.

iii) To provide information about Risk Mitigation measures available at the place of work.

iv) To provide the contractor with information on Owners Safety Plan & Regulations, Emergency Management Plan, lockout / tag out procedure, confined space entry, work permit system, excavation / trench permit system etc.

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v) To specify rules (e.g. for security including access arrangements) and safety rules such as fire protection, first aid arrangements, Work Permit systems etc.

vi) To provide comprehensive list of statutory regulations / standards and specification, to be complied with during execution of contract, in the tender document itself.

vii) To ensure training of the contractor workforce, medical examination, and proper usage of safety equipment.

viii) To specify the requirements of Health, Safety and Environment (HSE) (commensurate with the nature of job) in Pre- Qualification criteria.

ix) To designate Engineer-in-charge and safety officer.

x) To arrange for a multi-disciplinary safety audit team to conduct surprise / regular safety audits and monitor the implementation of the recommendations.

xi) To introduce suitable schemes for motivation of the contractor worker to adhere to safety guidelines.

xii) To review safety practices & their implementation through periodic surprise visit of the work sites and monthly review meeting.

xiii) To develop the HSE plans and incorporate the same in the tender document.

xiv) To liaise with external agencies like press, public etc and with law enforcement, regulatory, statutory agencies etc.

xv) To report to statutory agencies on safety compliance and accidents, if any.

4.1.2 Owner's Representative/Engineer-in-charge

The duties & responsibilities of engineer-in-charge should include:

i) To ensure that all Contract requirements including Health, Safety, Environment & Security are complied with.

ii) To ensure that contractor workforce deployed is adequately qualified, trained and in state of health to commensurate with the requirements of the job.

iii) To ensure that the Tools / Tackles and Machinery being used are properly tested and are in sound working conditions and necessary resources proposed for providing safe place of work and necessary PPE are being used.

iv) To take the required necessary corrective action immediately upon noticing or receipt of a report on noncompliance or any such condition which poses a threat to health, safety or environment. If during the course of execution of the contract, any situation of non-compliance with the contractor's safety and health plan are noticed / reported, the same will be taken up with the contractor for correction. In the event of repeated non compliance, suitable action to be initiated as per the contract.

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v) To ensure that the incidents are reported to all concerned within stipulated time frame.

vi) To ensure submission of a plan for safe working (Method Statement) from contractor and approval of the same by competent person / department.

vii) To ensure that Work Permit System in line with OISD-STD-105 is adhered to.

viii) To ensure availability of all the documentation needed for the execution of contract.

ix) To ensure that the quality controls have been maintained during fabrication/erection and all jobs required for safe commissioning have been carried out.

x) To ensure safe dismantling of all temporary facilities/connections put up by the contractor, after completion of work.

xi) To compile a report on the safety performance (at the conclusion of each contract or periodically such as annually for renewable and long-term contracts), which is to be considered in future when selecting contractors.

xii) To ensure that the Consultant, contractor and sub-contractor employ / designate qualified & trained Safety Engineer / Officer commensurate with requirement of the job.

xiii) To comply with all applicable safety and health standards, rules, regulations and orders issued by competent authority pertaining to the assigned activities.

4.1.3 Owner's Safety Officer

The duties & responsibilities of the Owner's Safety Officer should include:

i) To assess the hazards associated with jobs in consultation with all concerned and establish safe working procedure including identification of the escape routes.

ii) To establish a written record of factors which can cause injuries and illnesses and maintain statistical information for use in analysing all types of incidents and events involving contract personnel.

iii) To undertake routine/surprise inspections of all work sites and identify unsafe conditions & practices, if any. Check for compliance of the safety practices being followed with approved HSE Plan.

iv) To investigate promptly the incidents (including near-miss) in order to advise corrective and/or preventive action and assist management for its compliance.

v) To ensure periodic internal audits, review meetings, monitor and analyse HSE performance, nonconformities and suggest its corrective & preventive action.

vi) To encourage contractor and contract workers for reporting requirements ~~for~~ of occupational injuries and illnesses.

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vii) To advise whether the proposed working arrangements are safe and satisfactory, particularly at the interface between the contractor's planned work and owner's existing facilities.

viii) To communicate to the Contractor the imposed restrictions which may affect the work/personnel such as the temporary closure of a corridor or electrical isolation of equipment.

ix) To review and monitor the contractor's adherence to approved HSE plan and compliance thereof.

x) To design and conduct either independently or in collaboration with the training department, suitable HSE training programme for the prevention of personal injuries to Consultant, Contractor's Managers, Supervisors and workmen at all levels

xi) To identify areas of operations where specialized training is required to deal with potential dangers.

xii) To document and to bring to the attention of the Owner's Supervisor and Contractor any non-compliance/violation of the safety norms against approved safety and health plan or safety and health requirements and also raise these issues in the Safety Committee Meetings.

xiii) To take part in Tool Box Meetings at random and to ensure maintenance of records.

I. Establish, implement, maintain and review HSE objectives and programs including responsibility, authority, means & time frame at all relevant functions and levels.
II. Apprise the management about HSE status & help formulate appropriate policies for continual improvement.
III. Standardize PPE & Safety Devices, identify and develop approved vendors wherever required.

To organise campaigns, competitions, contests and other activities in association with the concerned departments, which will develop and maintain the interest of the contractor and contractor workers in establishing and maintaining safe conditions of work and procedures;

4.2 CONTRACTOR

4.2.1 Contractor's Management

Duties & responsibilities of the contractor should include the following:

i) To implement safe methods and practices, deploy appropriate machinery, tools & tackles, experienced supervisory personnel and skilled work force etc. required for execution.

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ii) To prepare a comprehensive and documented plan for implementation, monitoring and reporting of Health, Safety and Environment (HSE) and implement the same after its approval.

iii) To nominate qualified & trained Safety Engineers / Officers reporting to the Site in charge, for supervision, co-ordination and, liaison for the implementation of the safety plan.

Similar HSE Plan should be implemented at the sub- contractor's or supplier's site /office. However the compliance with the HSE Plan is to be the sole responsibility of the Contractor.

iv) To arrange facilities at suitable location in liaison with the owner for drinking water, toilets, lighting, canteen, lunch shelter, crèche etc. as applicable as per Laws/ Legislation at site and also arrange for workmen compensation insurance, third party liability insurance, registration under ESI / PF act etc as applicable.

v) To arrange for fire protection equipment as per the advice of owner.

vi) To ensure that its employees have completed appropriate health and safety training as required by the statute / regulation and also as per requirements of the Owner / Consultant. The documentation of such training imparted to all its employees should be maintained and produced for verification as required.

vii) To comply with all the security arrangements of owner.

viii) To ensure that the plant and equipment used on-site by contractor / employees is correctly registered, controlled and maintained in sound working condition.

ix) To ensure availability of First Aid boxes and First Aid trained attendant and other facilities as per requirement of factory Act / Building & Construction Workers Regulation (BOCWR).

x) To ensure that all incidents including near misses are reported immediately. Investigated with corrective and preventive action and learning are shared with all workers and all concerned at the earliest.

xi) To have HSE policy

xii) Maintain HSE performance data on yearly basis and submit to owner for evaluation

In construction projects where sub-contractors are engaged, the contractor should set out the responsibilities, duties and safety measures that are expected of the sub-contractor's workforce. These measures should include the provision and use of specific safety equipment, methods of carrying out specific tasks on safety and the inspection and appropriate use of tools.

The responsibilities indicated separately under contractor's Supervisor, Safety Officer and contract worker are contractually that of the Contractor and legally binding on the

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Contractor only. However the specific detailing as above has been given separately for guidance and operational convenience.

The selection of sub contractors, if employed, should be approved by the owner. Sub-contractor should comply fully with all safety rules and conditions applicable to the main contractor.

4.2.2 Contractor's Supervisor / Safety Officer

Duties & responsibilities of the Contractor's supervisor/Safety Officer should include the following:

i) To ensure strict compliance with work permit system by carrying out work only with appropriate work permits and after ensuring that all safety precautions / conditions in the permit are complied with and closing the same after job completion.

ii) To ensure that required guards and standard personal protective equipment are provided, used, and properly maintained including contingency requirement.

iii) To ensure inspection, tested, certification and maintenance of all tools and ensure removal of defective tools.

iv) To plan the workload and assign workers to jobs in commensuration with their qualification, experience and state of health.

v) To ensure that all the preventive measures for identified hazards (e.g. Job Safety Analysis, Job Hazard Analysis, HIRA, etc.) are in place and communicated to workers

vi) To take immediate corrective action against the violation of safety rules observed or reported.

vii) To ensure that the workers likely to be exposed to hazardous chemicals/materials have access to appropriate Material Safety Data Sheets (MSDS), and provide necessary mitigation measures.

viii) To ensure that appropriate warning signboards or tags are displayed.

ix) To ensure that all workers have proper training for their job assignments, including use of appropriate PPE, first aid and fire fighting equipment.

x) To ensure that only medically fit person shall be engaged in work and also ensure that sick / or injured workers during course of work should receive timely and appropriate first aid and/or medical attention.

xiii) To report each incident and/or injury in accordance with established procedures and assist in investigation.

I. Maintain Daily HSE observation log book at site
II. Conduct Tool Box talks along with Site Engineers/ supervisors.

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Maintain the published HSE literature, HSE regulations, codes and other communications. Advise management of compliance and conditions requiring attention.

A fulltime / dedicated Safety Officer should be assigned, where more than 100 workers are employed at site. For smaller jobs, the supervisor should assume the role of the safety officer also.

4.2.3 Contract workers

The duties & responsibilities of the contractor worker should include the following:

i) To perform work safely as per the job requirement and instructions.

ii) To inform all concerned regarding unsafe conditions / and unsafe acts.

iii) To wear PPE as stipulated and necessary for the job.

iv) To inform promptly to their supervisor regarding all work related incidents resulting in personal injury, illness and/or property damage.

v) To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

4.3 CONSULTANT

The activities and responsibilities covered under the scope of the Owner may be delegated to the consultant in those cases as applicable, based on the respective contract conditions. The primary responsibility of Consultant is to ensure compliance with agreed HSE plan for the contract by the Contractor. However those responsibilities conferred on Owner as Principal employer cannot be delegated to consultant.

Where the consultant's scope involves Engineering and Design, those factors under Designer (Para 4.4) should also be applicable.

In all cases, the Consultant's scope should include submission of latest HSE plans for work under his and Contractor's purview and implementing the same till job completion. It should conform to owner's overall HSE plan. This should include Guidelines and Implementation and Reporting Methodology to be followed with required report formats.

Adequate number of Safety Officers shall be provided by the Consultant with necessary skills required for the work to be performed.

The Consultant shall review the documents submitted by the contractor and advise owner on acceptance as well as advise suitability and number of Contractor's safety officers / supervisors.

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4.4 DESIGNER

The Process Designer should identify all hazards and risks likely to be encountered during fabrication, erection including dismantling, Pre-commissioning, commissioning and Performance run to meet the Guarantees and advise the risk mitigation measures.

All the hazards and safety measures to be adopted while handling Dangerous chemicals and Catalysts should be detailed by the Process Licensor and the same should be again included in the scope of the suppliers. Specific write ups/MSDS should be obtained from Patented single source suppliers also.

Designs should recognize, include and apply safe practice during preparation, construction and subsequent operational use and maintenance after completion of the Project.

All documents including drawings and calculations are to be originated, checked and approved in accordance with latest international codes, standards, specifications and design basis philosophy.

Use of low risk materials, non hazardous substances, use of low noise and dust-suppressed equipment etc. should be encouraged.

5.0 SAFETY MANAGEMENT

5.1 JOB SAFETY ANALYSIS (JSA)

Job safety analysis (JSA) provides a mechanism by which the contractor / owner, safety officer(s) and job supervisor(s) take a detailed look at how an individual task is performed , and its inherent hazards and preventive measures. This procedure helps in integrating accepted safety and health principles and practices into a particular operation. In a JSA, each step of the job is examined to identify potential hazards and to determine the safest way to do the job.

A job safety analysis includes five steps as below:

- Select a job
- Break the job down into a sequence of steps
- Identify the hazards against each of these steps (based on knowledge of accident, causes of injuries and personal experience) and determine the preventive measures to overcome these hazards
- Apply the controls to the hazards
- Evaluate the controls measures and revisit JSA if necessary

5.2 CRITERIA OF SELECTION OF A CONTRACTOR & SAFETY PERFORMANCE REVIEW

“Contractor Safety” can be ensured to a large extent if competent agency for execution of assignment or job, based on HSE system agreed upon by owner, is selected. It is necessary to assess his capabilities and competencies to perform work safely.

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A databank should be developed for all the contractors for their past performance on HSE aspects. An attempt should also be made to get similar data from other similar industries.

The data required will depend upon complexity involved in the job and type / size of resources required. Format needs to be suitably developed depending upon size, nature of the job & hazard associated therein. The format designed should also take care of the skill required to carry out the job.

Performance review is essential for all type of contractors. It helps in recording actual performance/experience with contractors while the contract is in progress. It is essential that resources agreed as per the contract are reviewed at mobilization stage for ensuring compliance from the day one and thorough effective supervision / monitoring system are at place.

This activity also helps in taking timely action in case of unsatisfactory performance to correct the situation and ensure safe work during execution period and deciding about suitability of the contractor for future jobs.

The periodicity of such performance review will depend upon size/type/complexity of contract. However, the performance should be reviewed periodically from mobilisation stage till the demobilization stage. Appropriate corrective action should be ensured.

5.3 SITE PLANNING AND LAYOUT

Before starting the construction/maintenance job at existing workplace in operation or green field locations, following should be ensured: -

i) Details regarding location of workshop/ fabrication yard, site office, stores, laboratory, electrical installations, placement of construction machinery, medical and welfare facilities, lighting underground and above ground piping route, cable route etc. should be decided prior to commencement of the work in consultation with owner / Consultants and implementation should be ensured. Layout should be displayed at strategic locations.

ii) The resources required to meet any emergency situations like fire fighting, first aid etc. should be planned and mobilized as per the job requirement.

iii) The sequence or order in which work to be done and any hazardous operations or processes should be identified.

iv) Free access to site shall be provided with clear roads, passage, gangways, staircases etc. Access to construction site should be leveled, open and free from any obstructions like construction material or scrap/waste, exposure to hazards such as falling materials, material handling equipment and vehicles. Any pit or ditch shall be covered or barricaded.

v) Arrangements should be made to maintain good housekeeping at site. Scrap and debris generated out of construction work should be removed/disposed off at a regular interval as directed. Emergency exit should be provided in case of blockade of primary exit.

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vi) Suitable warning notices and also the routes to and from welfare facilities should be displayed prominently.

vii) Pedestrian pathways and routes for vehicular traffic (light/heavy vehicles including material handling equipment) should be earmarked.

viii) Artificial lighting to be provided at places where work continues or workers pass by after sunset or in case natural light is insufficient like confined spaces.

ix) Keep all equipment /machines under cover to prevent them from dust, rain/flood water, heat etc. and follow storage instructions as applicable for each of them.

5.4 GATE ENTRY PROCEDURE

Gate entry at any site / workplace / unit is to be restricted to ensure entry of only authorised persons / vehicles.

5.4.1 Entry procedure for all contractor workers should be as follows:

A. Issuance of Pass

i) The passes are to be issued after the owner's representative/engineer-in-charge forwards the application of the contractor providing complete details of the workers being engaged. The contractor should be asked to submit Character & Antecedents (C&A) verification of individual worker from concerned authorities.

ii) The actual deployment of the workers at the construction site should be done after imparting the necessary safety induction training.

iii) With regard to issuance of passes for all vehicles including material handling equipment, owner's representative / engineer-in-charge should forward the application only after ensuring that all documents pertaining to the fitness of the vehicle/equipment and valid driving license of the driver**,** PUC of the vehicle, insurance of vehicle, etc. are available.

iv) The passes should be serially numbered with address, contractor name, identification mark, signature of the worker etc.

v) Special colour code for passes should be used for persons entering different areas like Administrative Block, Unit area, Project Area (wherever applicable).

vi) Contractor workers engaged on routine basis for long periods should be provided with monthly photo pass.

vii) Special permit is required separately for working beyond normal working hours and holidays.

B. Gate Entry

i) Entry of the contractor's employees should be permitted with valid gate passes only.

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ii) Entry of contractor's workers should be allowed in presence of authorized representative of contractor.

iii) Records of persons at the time of entry/exit should be maintained.

iv) At the entry gate of the location, a physical checking for non-carrying of lighter, matchboxes, explosives etc. should be carried out.

v) Gate passes/Identity Cards should be displayed on persons at all the times.

vi) For Mega-projects at existing / operating installations, it is preferable to have a separate gate for entry of contractor workers and also the project areas should be segregated fencing from operational area by fencing / other physical means.

vii) No vehicle should be allowed to enter in an operational area without proper flame arrestor.

viii) Awareness on Safety through training / posters etc. highlighting Do's and Don'ts should be spread within entire contractor workforce. Video/Audio tapes on Safety Topics should be played preferably.

ix) For occasionally engaged workers such as for material handling etc., spot photograph should preferably take with two copies (one for preparing the pass and other for attachment with gate register). Specific advice and recommendation of User Department should be given due cognizance. Relevant details are to be written. The pass should be collected back at the gate after day's work.

5.4.2 Tank Truck Loading (TTL) Operation :

At the loading / unloading location, a large no. of Tank Trucks of petroleum products enter the installation. Crew members are generally not regular entrants. The procedure should be as follows:

i) The gate pass should be issued to the individual crew members on written request of the transporter mentioning TT registration nos., License and certificate of training as per MV rule 9.

ii) Character & Antecedent (C & A) verification of the TTL crew through local police is to be done preferably and record maintained.

iii) For loading/unloading purpose, register entry at security gate is made before allowing entry into the premises with recording of names of crew members, time of entry, pass Sr. No., TT no. etc.

iv) For loading/unloading, crew is allowed entry alongwith TT only, after checking of TT from explosive/security point of view.

v) Out time, invoice no., Destination etc., are recorded while TTs go out of the security gate.

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5.5 TRAINING

Training is to educate contractor workforce on various hazards associated with the job/workplace and on the respective preventive / mitigation measures to avoid untoward incidents.

i) Workers should be adequately and suitably:

(a) informed of potential safety and health hazards to which they may be exposed to at their workplace;

(b) instructed and trained in the measures available for the prevention, control and protection against those hazards.

ii) No person should be employed in any work at a workplace unless that person has received the necessary information, instruction and training so as to be able to do the work competently and safely. The competent authority should, in collaboration with employers, promote training programs to enable all the workers to read and understand the information / instructions related to safety and health matters.

iii) The information, instruction and training should be given in a language understood by the worker and written, Oral, visual and participative approaches should be used to ensure that the worker has assimilated the information.

iv) Every worker should receive instruction and training regarding the general safety and health measures common to the workplace. This should include:

(a) general rights and duties of workers at the workplace;

(b) means of access and egress both during normal working and in an emergency;

(c) measures for good housekeeping;

(d) location and proper use of welfare amenities and first aid facilities provided;

(e) proper use and care of the items of personnel protective equipment and protective clothing provided to the worker;

(f) general measures for personal hygiene and health protection;

(g) fire precautions to be taken;

(h) action to be taken in case of an emergency;

(i) requirements of relevant safety and health rules and regulations.

(j) training on hazards and mitigation measures for specific area where worker is assigned to work shall be given as part of entry procedure

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(k) Job specific training / refresher course shall also be given at regular intervals.

(l) It is also expected that behaviour based safety culture shall be encouraged and all the workers will be involved.

Copies of the relevant safety and health rules, regulations and procedures should be available to workers upon the commencement of and upon any change of employment.

5.5.1 Training Techniques

a) Lectures

This technique should be applied when it is required to transfer information in local language to a large contractor workforce with controlled content and time.

b) Case Study

This is an effective technique based on the presentation of case of real events by Trainer to highlight probable causes like Human Error, ignorance about the job etc.

c) Videos

Videos, an effective technique of communication, should be used to display the right techniques of performing a task in a safe manner and hazards associated with a job.

d) Demonstration at site

Right way to do a job should invariably be demonstrated to workers at the site itself. The right way is also a safe way. Hazards due to wrong procedures, short cuts and their adverse effects etc. should also be highlighted.

5.5.2 Training/Awareness Module and Frequency

A. General Safety Training to all categories of contractor employees should be imparted before induction and annually thereafter. No person should be allowed to enter the installation without undergoing this training. This training program should cover:

i) Mandatory uses of PPE like Cotton clothes, Helmet, Safety Shoes, Full Body Safety harness, dust masks, safety goggles, etc.

ii) Probable Hazards related to industry

iii) Job specific hazards

iv) Important Telephone No / Escape route

v) First Aid

vi) Use of Fire extinguisher

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vii) Location of assembly points

viii) Procedure of calling fire crew in case of any emergency

ix) Wind direction

The contractor workers, if engaged in operation of the plants/facilities, should be trained in line with Clause No. 4.6 of OISD-GDN-206 on "Safety Management System". For other categories of contractor workers, training modules for different category employees are as follows:

B. Contractor Supervisor

Contractor Supervisor should be trained in accordance with the provision of clause no. 5.1.1.2, 5.2.7, 5.3.10, 5.6.12 and 5.7.8 of OISD-STD-154 on 'Safety Aspects in Functional Training'

C. Contractor Worker

Yearly training programme should be carried out for contractor worker and the records should be maintained. The training programme should cover at least the following:

i) Worker responsibility for safety of himself and work area.

ii) Associated hazards with the job and job area including electrical shock hazards.

iii) Importance of First Aid fire fighting equipment, their use & operations

iv) Communication system at the installation

v) Fire / Accident Reporting procedure

vi) General Safety rules

vii) Safety Measures during execution of job such as:

- Welding / Cutting / Grinding
- Working at height
- Confined space entry
- X ray / radiation
- Erection / Dismantling of scaffolding
- Tank construction and repairs
- Handling of chemicals etc.
- Hydrojetting
- Leak testing of pipelines and equipment (hydro and pneumatic testing)
- Grit / other methods of blasting for surface preparation blasting etc.
- Chemical cleaning & pickling
- Catalyst loading & storage
- ELCB

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viii) Importance & use of PPE

ix) Emergency Routes

x) Assembly Points

xi) Job Specific Training

D. Consultant / Contractor

Awareness program should be carried out for demarketed Consultant / Contractor at the time of induction. This program should cover at least the following:

i) Responsibility of contractor for safety of their personnel and work area

ii) Hazardous property of Petroleum products and chemical used

iii) Communication system

iv) Fire / Accident Reporting procedure

v) Medical facility available

vi) Statutory requirements

vii) Importance of First Aid equipment and required at the site

viii) Work Permit system

ix) Direct/ Indirect losses due to accident

x) Safety Measures while executing the jobs such as:

- Welding / Cutting / Grinding
- Working at height
- Confined space entry
- X ray / radiation
- Erection / Dismantling of scaffolding
- Tank construction and repairs
- Handling of chemicals etc.
- electrical jobs
- Hydrojetting
- Leak testing of pipelines and equipment (hydro and pneumatic testing)
- Grit / other methods of blasting for surface preparation blasting etc.
- Chemical cleaning & pickling
- Catalyst loading & storage
- ELCB

xi) Safety training needs of their supervisors and workers

xii) Importance & Use of PPE at the site

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xiii) General Safety rules at the installation –

General points:

Workers should not be allowed to take meals or take rest inside the construction / plant area.

E Security Personnel

Training program should be carried out for Security personnel at the time of induction and annually thereafter and the records should be maintained. The training program should cover at least the following:

i) Layout of Plant and Facilities
ii) Vulnerable locations
iii) Safety regulations (Statutory and in company)
iv) Fire Protection Facilities and Locations
v) Role in case of Fire / Disaster
vi) Emergency Procedure and Drills
vii) Industrial First Aid
viii) Use of Personnel Protective Equipment
ix) Disaster Management Plan

5.6 INSPECTION / AUDIT

Inspection / Audit is a tool to evaluate compliance of all safety requirements. Most of the information could be gathered through site inspection using ready-made check lists to ensure that contractors / agencies abide by the safety rules and norms while working at operating / construction sites.

A checklist, while carrying out different type of jobs, should be developed based on hazards associated with the job being performed and requirements as per OISD-GDN-192 on "Safety Practices during Construction". Typical format is enclosed at Annexure II, which should be modified to suit the requirement of the site / job to be done.

Before starting the work and at regular intervals thereafter, Contractor's Supervisor/safety Officer and Owner's representative / Engineer-in charge/safety Officer should inspect as per the checklist so prepared to ensure that contractor has prepared to start the work with all safety precaution required for safe execution of job.

5.7 FINANCIAL DETERRENTS FOR NON-COMPLIANCE OF SAFETY RULES/ PROCEDURES

Financial or other type of penalties like seizure of gate passes, stoppage of work for a limited period etc. should be levied on the contractors or their workers for non-compliance of safety rules. A provision of suitable accident severity based penalty clause for contractor should be incorporated to ensure adherence of systems and procedures.

The financial deterrent clauses shall be included in the general terms and conditions of the contract. The violators of the clauses shall be suitably punished. Following list shall be taken as a guide while preparing the financial deterrent clauses but need not be limited to these conditions only.

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A few of the usual non-compliance are as follows:

I. Working without valid work permit/ Violation of any of the conditions specified in the permit.

II. Throwing up/down any material from height or not making proper provision to bring down material safely from height

III. Non standard/unsafe platform/ladder, Non standard/unsafe Scaffolding

IV. Non-usage of PPEs like Safety helmet / Safety shoes / Safety goggles / Welding Shield / Respiratory protection etc. by the contractor personnel

V. Non use of ELCB , using poor joints of cable, using naked wire without top plug into the socket, laying wire/cables on the roads without sleeve.

VI. Carrying out electrical jobs by un-authorised person

VII. Non deployment of the licensed electricians for electrical job.

VIII. Unsatisfactory fencing / barricading of excavated areas, Not providing proper shoring /strutting /proper slope and Not keeping the excavated earth at least one meter away from excavated area

IX. Over speeding of vehicles, rash driving, wrong side parking & parking in front of any fire-fighting equipment.

X. Riding on material handling vehicles or trolleys or hydra.

XI. Non-deployment of safety supervisor / supervisor responsible for safety at work site

XII. Failure to maintain safety register and record by Contractor Safety Supervisor or Supervisor responsible for safety.

XIII. Acting in contravention to any of the provision mentioned in Factories Act 1948 and/or the rules framed there under including all amendments thereto.

XIV. Failure to furnish a first information report (FIR) as per prescribed Pro-Forma within 4 hours of the incident.

XV. Keep and maintain proper records of all incidents occurred at work site.

XVI. Working beyond statutory limits by contractor's workers.

XVII. Deployment of child or adolescent labour.

XVIII. Use of untested and uncertified pressure vessel. Use of untested and uncertified lifting tools/tackle.

XIX. Unsafe handling of compressed gas cylinders No trolley or jubilee clips or double gauge regulator or flash back arrestor on both gas lines & both ends or improper storage / handling or cylinders without caps when not in

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use/damaged hoses). Keeping compressed gas cylinders in horizontal position.

XX. Transporting metallic items below overhead lines, without isolation.

XXI. Damage to fire equipment like hydrant & monitors, fire extinguishers including non return of fire equipment

XXII. Horseplay at work site.

XXIII. Non-provision of basic safety requirement such as 24 V lamp for working in confined space, uncertified / non standard lifting tools, earth leakage protection & earthing connections for electrical appliances as per Indian Electricity Rules, emergency isolation switches etc.

XXIV. Keeping gas cylinders inside the confined spaces.

XXV. Non-usage of the full body safety harness and fall back arrester with life line properly anchored by the workers while working at height

XXVI. Violation of Safety Permit conditions like Firefighting equipment.

XXVII. Non-barricading of area while rigging, digging etc.

XXVIII. Working without valid work permit.

XXIX. Un-authorised road closure/blockage.

XXX. Not clearing the work site on regular basis.

XXXI. Leaving contractor owned leftover material at site at the time of demobilization.

5.7.1 REWARDS AND RECOGNITIONS

The contract employees should be suitably rewarded as per a scheme, with monetary benefits/ prizes for timely reporting of the Near miss incidents/ Unsafe conditions/ Unsafe Acts based on the accident potential if it could have occurred.

The compliance to safety procedures by the contractors shall be evaluated annually as per the scheme based on different leading and lagging indicators and shall be awarded during the safety week celebrations.

The best safety conscious worker as recommended by the safety officers of different contractors during short term jobs such as the turnaround maintenance activities shall be suitably rewarded for motivating the workers to comply with safety requirements.

The best safety officer/supervisors of the contractor shall be recognized and shall be suitably rewarded during the safety week celebrations.

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5.8 INCIDENT REPORTING AND INVESTIGATION SYSTEM

All the incidents including near-miss should be reported immediately by contractor's Supervisor to Contractor and owner's Supervisor / Engineer-in-charge, who should inform to Owner's Safety Officer and owner's Management. Owner's Safety Department will be required for onward reporting as per OISD, Statutory requirements.

All accidents regardless of the extent of injury or damage should be investigated in order to find probable causes, lessons learnt thereof and remedial measures required to prevent its recurrence.

The incident investigation should be done as per provision of clause no. 4.12 of OISD-GDN-206 on 'Safety Management System'.

All the recommendations of investigation / Enquiry Report need to be monitored closely for its implementation. A proper record should be maintained to ensure implementation of all the recommendations and same should be reviewed from time to time.

5.9 SAFETY COMMITTEE MEETINGS

Following three type of safety committee meetings should be held aiming at raising the level of safety consciousness at the site:

5.9.1 Toolbox meeting

To maintain awareness, update training and convey important safety and health information, contractor supervisors should conduct tool box meetings at least weekly and also prior to start of any work. All the contractor workers should attend this meeting. The owner's supervisor/Engineer-in-charge and safety officers should also attend these meetings on random basis. Tool box meeting should be conducted more frequently depending upon circumstances. Record of the same can be maintained in the following typical format.

TOOL BOX MEETING FORM

A Toolbox Talk is a safety meeting allowing open environment for discussion with the work force. It focuses on safety topics related to the specific job, such as workplace hazards and safe work practices. It is aimed to refresh workers' knowledge, cover last minute safety checks, to raise workers' awareness of specific problems on site. Toolbox Talks are also intended to facilitate health and safety discussions on the job site and promote safety culture. It also helps to remind workers that health and safety are an important part of the working day.

Toolbox talk should be short in duration and conducted at the job site prior to the commencement of a new job or work shift. Toolbox Talks can be used for post-accident communications / accident case study, re-enforcement of safe work practice and pre-task planning etc.

Contractor supervisors should conduct tool box meetings at least weekly and also prior to start of any work. All the contractor workers should attend this meeting. The owner's supervisor/Engineer-in-charge and safety officers should also attend these meetings on

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random basis. Tool box meeting should be conducted more frequently depending upon circumstances.

A toolbox talk should cover following topics;

- Review of the hazards related to job being done. What safety equipment and PPEs should be used? What procedures should be followed?
- Review and analyse recent safety violations— What was the violation? What hazard did it create? What injury could have occurred?
- Review and analyse recent injuries— What happened? Why did it happen? What should have been done?
- Ergonomics and behaviour related tips.
- Importance of PPEs and proper tool for specific jobs.
- Housekeeping

Records of such talks should be maintained. Following information should be included when completing a Toolbox Talk Form:

- Names and signatures of all persons present,
- Topics discussed,

Any job specific training or instructions that have been given in the meeting and who raised the issue or added to the discussion, to show that there has been active consultation with all persons attending the meeting and that all parties have had a chance to raise issues.

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TOOL BOX TALK RECORD

DATE_____ **TIME:**_____ **LOCATION:**_____
DELIVERED BY:_____**WITNESSED B Y:** _____
JOB DISCRIPTION:_____
NAME OF THE CONTRACTOR:_____

Toolbox Talk – Topics / Issues discussed
Other points or issues raised by attendees

NAME	SIGNATURE	NAME	SIGNATURE

5.9.2 Site Safety Committee Meeting

Primary purpose of this safety committee is to enable owner, contractor and workers to work together to monitor the site safety and health plan so as to prevent accidents and improve working condition on site. Its size and membership will depend on the size and nature of job.

The safety committee should include representatives of owner, consultant, contractor identified as safety officer / supervisor. It should be headed by Engineer-in-charge.

The safety committee should have regular and frequent meetings, atleast fortnightly, to discuss the safety and health program on site and to make suggestions for improvement. The meetings should be documented with a time bound action plan. The functions carried out by safety committee should include:

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i) Review compliance of pending items of last Safety meetings. All critical items should be identified and their compliance ensured.

ii) Consideration of the reports of safety personnel.

iii) Discussion of accident/near-miss and illness reports in order to make appropriate recommendation for prevention.

iv) Examination/evaluation of suggestions made by workers.

v) Dissemination of acquired knowledge through training programs and information sharing sessions.

vi) Discussion & review of Fire Prevention & Disaster Management Plan.

vii) To send recommendation to Apex Body for consideration / approvals.

5.9.3 Safety Review Meeting by Location Head

This meeting should be headed by the Location head and attended by Owner's Supervisor / Engineer-in-charge, owner's safety Officer and all concerned department heads. Prime purpose of this review is to ensure that all the recommendations of various committees are being complied with and to take decisions on critical points raised. This meeting should take place at least once in every quarter. All the investigation reports / audit findings with status of implementation of recommendations should be discussed.

5.10 SAFETY EQUIPMENT / PERSONNEL PROTECTIVE EQUIPMENT

The type of safety equipment to be used is decided based on the job requirement. Selection should be made based on OISD-GDN-192, OISD-STD-155 (Part I & II) and the job requirement. Safety equipment / Personnel Protective Equipment (PPE) shall be of approved make. Contractor shall provide necessary training to each employee regarding proper usage and upkeep of PPE including its limitation.

A register showing stock and issue of PPE should be maintained by the contractor at site and must be available for inspection. 10 to 20 % of PPE in excess of actual requirement to meet contingency requirement should be maintained at site.

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REFERENCES

1) OISD-GDN-206 on “Safety Management System”

2) OISD-GDN-192 on “Safety During Construction”

3) OISD-STD-155 Part (I & II) on “Personnel Protective Equipment”

4) Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996 & Rules thereof

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ANNEXURE I

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

Sl.no.	Code No.	Title
1	IS: 818	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
2	IS: 875	Code of practice for Structural safety of buildings: Masonry walls
3	IS: 933	Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
4	IS: 1179	Specification for Equipment for Eye and Face Protection during Welding – First Revision
5	IS: 1904	Code of practice for Structural safety of buildings: Shallow foundations
6	IS: 1905	Code of practice for Structural safety of buildings: Masonry walls
7	IS: 1989 – Part II	Leather Safety Boots and shoes for heavy metal industry
8	IS: 2171	Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision
9	IS: 2361	Specification of Building Grips – First Revision
10	IS: 2750	Specification for Steel Scaffoldings
11	IS: 2925	Specification for Industrial Safety Helmets – First Revision
12	IS: 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision
13	IS: 3521	Industrial Safety Belts and harnesses
14	IS: 3696 – Part I	Safety Code for Scaffolds and Ladders: Part I – Scaffolds
15	IS: 3696 – Part II	Safety Code for Scaffolds and Ladders: Part II – Ladders
16	IS: 3764	Safety Code for Excavation Work
17	IS: 4014 – Part I & II	Code of Practice for Steel Tubular Scaffolding
18	IS: 4081	Safety Code for Blasting and Related Drilling Operations
19	IS: 4082	Recommendations on stacking and storage of construction materials at site

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20	IS: 4130	Safety Code for Demolition of Buildings – First Revision
21	IS: 4138	Safety Code for working in compressed air – First Revision
22	IS: 4756	Safety Code for Tunneling works
23	IS: 4912	Safety requirements for Floor and Wall openings, Railings and toe boards – First Revision
24	IS: 5216 – Part I & II	Recommendations on safety procedures and practices in electrical work
25	IS: 5121	Safety code for piling and other deep foundations
26	IS: 5916	Safety Code for Construction involving use of Hot Bituminous materials
27	IS: 6994 – Part I	Specifications for safety gloves: Part I – Leather and Cotton gloves
28	IS: 5983	Specification for Eye Protectors – First Revision
29	IS: 6922	Criteria for safety and design of structures subject to underground blasts
30	IS: 7155	Code of recommended practices for conveyor safety
31	IS: 7205	Safety Code for Erection on Structural Steel Works
32	IS: 7069	Safety Code for Handling and Storage of Building Materials
33	IS: 7293	Safety Code for Working with Construction Machinery
34	IS: 7323	Guidelines for operation of Reservoirs
35	IS: 7969	Safety Code for handling and storage of building materials
36	IS: 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals
37	IS: 8989	Safety Code for Erection of Concrete Framed Structures
38	IS: 9706	Code of Practices for construction of Arial ropeways for transportation of material
39	IS: 9759	Guidelines for de-watering during construction
40	IS: 9944	Recommendations on safe working load for natural and manmade fibre rope slings
41	IS: 10667	Guide for selection of industrial safety equipment for protection foot and leg

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42	IS: 10291	Safety Code for dress divers in civil engineering works
43	IS: 10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects
44	IS: 10386 – Part II	Safety Code for Construction, Operation and Maintenance for River Valley Projects
45	IS: 11057	Code of Practice for Industrial Safety Nets
46	IS: 13415	Code of Practice on safety for Protective barriers in and around building
47	IS: 13416	Recommendations for preventive measures against hazards at working places

Statutory Regulations

Latest Statutory Acts and Rules, as given below, should be referred:-

1. The Petroleum Acts 1934 and Petroleum Rules 2002
2. The Factory Act, 1948 (As amended by Factory Amendment Act 1987) and concerned Factory Rules
3. The Water (Prevention and Control of Pollution) Act 1974 & Rules 1975
4. The Environment (Protection) Act 1986 and rules thereunder
5. The Manufacturing, Storage and Import of Hazardous Rules 1989
6. The Hazardous Wastes Management (Management & Handling) Rules 1989
7. The Indian Electricity Act 1901 and Rules 1956
8. The Indian Explosive Acts, 1884 & The Indian Explosive Rules 1983
9. The Gas Cylinder Rules 1981and the static & Mobile Pressure Vessels (Unfired) Rules 1981
10. The Indian Boiler Act 1923 and Regulations 1950
11. The Public Liability Act 1991 as amended in 1992
12. The Motor Vehicle act 1988 and Central Motor Vehicle rules 1989
13. Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996

In addition to above, various other statutory acts like EPF, ESIS, Minimum wage act and other local statutory requirements shall also be complied with.

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ANNEXURE II

CHECK LIST FOR SAFETY INSPECTION / AUDIT

Job _____ Location _____ Date of Audit_____Frequency _____

Inspected by _____ Contractor (s) _____

Sl.no.	ITEM	YES	NO	NA	REMARKS / ACTION
1.0	**PERSONNEL PROTECTIVE EQUIPMENT (PPE):** Are following PPEs being used as per the job requirements?				
A.	**Minimum mandatory PPEs**				
A1	Safety Helmets (with chin strap)				
A2	Safety Shoes				
A3	Safety Goggles				
A4	Safety hand gloves				
B.	**Job specific PPEs**				
	Whether need of specialised safety PPE identified and documented?				
B1	Full body safety harness with double lanyard				
B2	Fall arrester				
B3	Ear Plug / Ear Muff				
B4	Gum Boots				
B5	Face shield				
B6	Shot/Grit/Slag blasting hood				
B7	Breathing Apparatus				
B8	Gas Filter Mask / Dust Mask				
B9	Hand Gloves (Chemical/ Welding/ Electrical/ anti-vibration/ High temperature/ cold burn etc.)				
B10	Boiler Suit / Fire-retardant suit / Electrical flash fire retardant suit /High pressure water cleaning (Hydrojetting-Turtle) suit /				

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	Chemical suit / Low temperature suit etc.				
B11	Others				
C.	Whether workers are trained / briefed to use the PPEs?				
D.	Whether system of checking the quality / quantity of PPEs provided by contractor exists and in practice?				
E.	Whether as per contract the contractor is obliged to arrange the required PPEs to its workmen and the same is being complied with ?				
2.0	**HOUSE KEEPING**				
2.1	Whether Standards of housekeeping are defined in contract and housekeeping is being maintained accordingly?				
2.2	Whether areas are identified and marked for stacking of material like scrap, pipes, plates, cement, sand, loose excavated material etc.?				
2.3	Whether surplus excavated material, debris and scrap material is being removed and disposed on regular basis as per contract?				
2.4	Whether path ways, roads, stairs etc. in the vicinity of work place are maintained free from obstructions?				
2.5	Whether appropriate actions are taken to avoid the slippery area due to water logging / oil spillage?				
2.6	Whether system for collecting and disposal of small size scraps like welding buds, small size metal pieces, insulation material in place.				
2.7	Whether area is maintained free from vegetation, garbage etc. and the work place is kept clean and free of any hazard?				
2.8	Others				
3.0	**EXCAVATION**				
3.1	Whether detailed plan of excavation including soil stability is made and approved by competent authority?				
3.2	Whether excavation hot work permit is taken?				

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3.3	Whether the workplace is thoroughly inspected before issuance of work permit, as stipulated in OISD-STD-105?				
3.4	Whether special conditions mentioned in the permit are clearly explained to the supervisor and in turn to the contractor workers and documented?				
3.5	Whether proper shoring for the excavation is provided to prevent cave-in for side of slope more than the safe angle of repose (generally around 45 degrees) of the soil being excavated?				
3.6	Whether proper precautions have been taken if the excavation is adjoining to heavy structure like building, street and roadways?				
3.7	While excavating whether proper slope usually 45^0 & suitable benches of 0.5 m width at each 1.5 m depth are provided?				
3.8	Whether barricading of 1m height with glowing caution board is provided for excavation beyond 1.5m depth?				
3.9	Whether excavating earth is placed beyond 1m or depth of the excavation whichever is more, from the edge of the trench?				
3.10	Whether heavy vehicle movement is restricted to come too close (minimum 2 M from the edge of excavation) to the excavating area?				
3.11	Whether adequately anchored stop blocks and barriers are provided to prevent vehicles being driven into the excavation? Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.				
3.12	Whether necessary precaution is taken for underground pipes, sewers, cables by contractors?				
3.13	Whether extra precaution is taken for bailing out water properly while excavating?				
3.14	During rains whether the excavation is				

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	done with extra precaution to prevent caving in?				
3.15	Whether two separate entry/ exit points with necessary ladders / steps, as per requirement, have been provided?				
3.16	Whether required no. of persons are available (as per OISD-STD-105) at all the time to communicate any hazards noticed with workers working in deep trenches or excavation?				
3.17	Whether necessary precautions like regular gas testing are being taken in areas having hydrocarbons and toxic gases so that no gas accumulation takes place in the trenches.				
3.18	Whether IS: 4081-1986 & Indian Explosive act & rules for storage, handling & carrying of explosive material and execution of blasting operation is followed?				
3.19	Whether in case of mechanised excavation, caution board is provided for do's and don'ts like 'Nobody to enter' within one meter of the extreme reach?				
3.20	Whether the following observations are being documented during excavation work and corrective actions taken :- a) Boulder formation encountered b) Collapsing / development of cracks of sides c) Marked damage to support d) Unexpected fall of ground e) Inspection of site after each blast. f) Water logging g) Unexpected utility/cabling				
3.21	Others				
4.0	**PERMITS**				
4.1	Whether valid work permit is issued in compliance to OISD-STD-105 to start any work?				
4.2	Whether before issuing the permit, JSA carried out and mitigation measures made				

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	part of work permit?				
4.3	Whether personnel working at site were given tool box talk about the hazards and emergency procedure with important do's and don'ts and record maintained?				
4.4	Whether all conditions of the permit are fulfilled before starting the job?				
4.5	As noted in the permit, whether compliance of all the recommendations are ensured during entire duration of the job?				
4.6	Whether permits are available at work site all the times?				
4.7	Whether hot work permit registered in fire station / designated safety officer?				
4.8	Whether permits are being closed after the completion of job?				
4.9	Others				
5.0	**SAFETY IN CUTTING / WELDING/GRINDING**				
5.1	Whether LPG / Oxygen / Acetylene/ Gas cylinders are kept outside only while working in confined space?				
5.2	Are Acetylene/ O_2 / LPG cylinders kept in upright position with required valve cap and secured at designated places under shed – wet fire retardant clothes ~~gunny bags~~ wrapped around it if the same is under sun at designated place?				
5.3	Check cylinder and cylinder valves for approved quality & any kind of damage?				
5.4	Whether protective valve ~~s~~ caps are kept on cylinders while not in use?				
5.5	Whether proper means and method for transportation of cylinders to avoid dropping and rolling are being adopted / followed?				
5.6	Whether gas cylinders, regulators are				

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	kept away from combustible materials and ~~/~~free from oil and grease?				
5.7	Whether all hoses are of approved quality and found to be free of any damage or crack?				
5.8	Whether oxygen and acetylene cylinders are stored separately at a distance of at least 5 feet from each other and kept under shade as per Gas Cylinder rules 2002?				
5.9	Whether gas cylinders are kept at safe location particularly in case job is being done at different elevations while in use?				
5.10	Whether color coding is being used for easy identification of different type of cylinders and hoses?				
5.11	Whether cylinder keys are available near the cylinder?				
5.12	Whether gas torches with flash back arrestors of approved make are only being used?				
5.13	Whether pressure gauges are in working condition and checked from time to time?				
5.14	Whether welding shields are used while welding?				
5.15	Whether proper earthing for welding machines are provided?				
5.16	Whether power is taken from approved sources (welding receptacles)?				
5.17	Whether welding receptacles are properly grounded?				
5.18	Whether welding cables are maintained in good condition and without any joints/ cuts?				
5.19	Whether to avoid short circuit, welding machines are protected against rain?				
5.20	Whether earth connectors are securely connected to the job and not to the				

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	adjoining pipeline or structure?				
5.21	Whether flame arrestor of DG set is of approved make and quality?				
5.22	Whether 30mA rating ELCB is provided on power supply.				
5.23	Whether separate power supply arrangement is provided for portable oven?				
5.24	Others				
6.0	**ABRASIVE (SHOT/GRIT/SLAG) BLASTING**				
6.1	Whether abrasive blasting is used only after getting approval from competent authority / work permit?				
6.2	Whether air compressor used for abrasive blasting are positioned away from work place?				
6.3	Whether exhaust of the prime mover is directed away from the work place?				
6.4	Whether in case of motor driven compressor, the body of the motor as well as the compressor is properly earthed?				
6.5	Whether line operator of abrasive blasting wear suitable PPEs including mask?				
6.6	Whether adequate measures are adopted to confine dust / flying particles?				
6.7	Whether adequate measures are taken for proper ventilation while the work is done in confined space?				
6.8	Whether the Air receiver vessel of the compressor is pressure tested.				
6.9	Others				
7.0	**SAFETY WHILE WORKING AT HEIGHTS / SCAFFOLDING / LADDERS**				
7.1	Whether work permit is obtained to take up work at height above 2.2 meters?				
7.2	Whether steel pipes scaffoldings are used in unit/off site areas?				

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7.3	Whether provision for suitable platform with all scaffoldings are made? Whether its construction is as per specification with toe board and railing?				
7.4	Whether the area below working at height is cordoned?				
7.5	Whether ISI approved quality and good condition full body safety harness with shock absorber are used while working at heights?				
7.6	Whether life line of full body safety harness with shock absorber is anchored to an independent secured support capable of withstanding load of a falling person?				
7.7	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person?				
7.8	Whether lifeline ropes used are of good condition and adequate strength free of defects?				
7.9	Whether ladder is placed at secured and leveled surface?				
7.10	Whether it is extended 1.0 Meters above the landing point?				
7.11	Whether ladder used are of adequate length and tying short ladder is avoided?				
7.12	Whether metallic ladders are placed away from electrical system?				
7.13	Whether tools or materials are removed after completion of the day's job at heights?				
7.14	Whether a valid permit is obtained before taking up work on asbestos or fragile roof?				
7.15	Whether sufficient precaution like roof ladders, nets, lifeline, full body harness, etc. is taken while working on fragile roof?				

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7.16	Whether provision is made to arrange duck ladder, crawling board for working at fragile roof?				
7.17	Whether scaffolding has been erected on rigid / firm / leveled surfaces only?				
7.18	Whether scaffold has been inspected by competent person & tagged accordingly prior to being put in use?				
7.19	Whether the scaffolding has been designed for the load to be borne?				
7.20	Whether the erection and dismantling of the scaffolding is being done only by trained persons and under competent supervision?				
7.21	Whether safety net with proper working arrangement and life line has been provided?				
7.22	Others				
8.0	**SAFETY IN CONFINED SPACE**				
8.1	Whether positive isolation is done as per approved blind list and crossed checked by competent person?				
8.2	Whether a permit is obtained to enter a confined space?				
8.3	Whether gas test for hydrocarbon, toxic gas, oxygen level is checked for acceptable limits before entering any confined space and recorded? If levels are beyond permissible limit, whether required PPE like BA, Gas Mask are used.				
8.4	Whether adequate oxygen level is ensured in confined space before entering? If not, whether all precaution like using of Breathing Apparatus set is ensured?				
8.5	In case of chance of ingress of hydrocarbon gases / toxic gases, whether Personnel Monitoring System (PMS) is used ?				

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8.6	Whether only in presence of a supervisor, worker enters in confined space?				
8.7	Whether provision of sufficient means of entry and exit is available?				
8.8	Whether provision of ventilation to remove welding fumes, dust, exhaust gases are made?				
8.9	Whether provision of 24V (Hand lamps with cage as per OISD-STD-155) light for working inside space is made?				
8.10	Is it strictly ensured that stand-by trained persons (2 nos.) are standing outside before a person enters a confined space and communication is being maintained all the time with workers working inside?				
8.11	Whether life belt with one end under control of stand-by person outside is kept while working in confined space?				
8.12	Whether Personnel protective Equipment as specified in the permit are in good condition?				
8.13	Whether boxing up is done only as per the approved procedures and under the supervision of competent persons?				
8.14	Whether all the safety precautions listed in OISD-GDN-192 are taken while working in sewers, OWS etc.?				
8.15	Whether proper house keeping is being maintained inside the confined space?				
8.16	Whether training has been provided to workers working in the confined space and the workers only of sound health are being asked to work in the confined space?				
8.17	Others				
9.0	**SAFETY IN MATERIAL HANDLING**				
9.1	Whether all lifting tools, tackles, machines, chains, ropes etc. are of sound construction, made of sound material and				

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	maintained in good condition?				
9.2	Whether lifting tools & tackles are tested as per norms and safe working load, date of testing visibly marked/painted on the equipment?				
9.3	Whether lifting tools, tackles are of adequate strength for the load to be handled?				
9.4	Whether all parts including the working gears fixed or movable of every lifting machine, chain, rope, tackles specify the following condition: a) Thoroughly examined by competent person at least once a year or such interval as required by statutory authority. b) Document of such examination are maintained and produced to owner supervisor before use of particular equipment?				
9.5	Whether chain blocks and cables are inspected before each use to assure their sound condition?				
9.6	Whether hoist and lift, if used are: a) Properly maintained and thoroughly examined by competent authority at least once in every year. b) A register to be maintained to record particulars of such examination in prescribed forms and shall be produced to the owner supervisor before use.				
9.7	Whether area below the movement of boom of crane is cleared to avoid injury from falling objects?				
9.8	In crane handling area whether it is ensured that crew of truck, leave the truck before starting loading / unloading?				
9.9	Whether transporting material from one place to another is done by suitable				

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	means?				
9.10	Whether carrier with sufficient capacity without projecting parts is used for transporting materials?				
9.11	Whether riggers engaged are well trained and conversant with signaling procedures including night signaling if required?				
9.12	Whether permission of authorized person is obtained before working on or near an overhead crane?				
9.13	Whether trained riggers are available all the time along with crane?				
9.14	Whether barricading has been done to ensure no unauthorised person enters in the working area of the crane?				
9.15	Whether lifting (rigging) plan has been prepared and approved before start of the work?				
9.16	Whether route of crane movement has been planned before the crane moves out of the garage?				
9.17	Whether it has been ensured that no electrical cable comes within 3 meters or safe distance from the boom of the crane?				
9.18	Whether boom is being kept in the horizontal position or locked while idling?				
9.19	Whether material is being stacked / destacked in trucks with the help of wedges to ensure no slippage while loading / unloading takes place?				
9.20	Whether the forklift / crane is being operated only by trained / authorized person?				
9.21	Others				
10.0	**ELECTRICAL SAFETY**				
10.1	Has the Electrical Line Clearance				

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	procedure been followed involving electrical and other concerned Dept. and filling of formats?				
	Whether the "LOTO" system is defined properly and all personnel are aware with the procedure?				
	Whether "LOTO" system is being used in all electrical isolation jobs, by all departments?				
10.2	Have Danger Signs with Voltage rating/ Men at work signboards been displayed at both Sub Station as well as the work site?				
10.3	Has the contractor worker understood the electrical circuit on which he is going to work with probable electrical hazards and mitigation measures to be adopted?				
10.4	Whether contractor has engaged electrician (s) having valid electrical license in line with provisions in Indian Electricity Rules?				
10.5	Have all checks prior to switching operation been carried out and authorisation of owner/ user section obtained subsequently?				
10.6	Have all earthing links on electrical conductors removed before charging the line/ apparatus?				
10.7	Are PPE as prescribed under Indian Electricity Rules available, kept healthy and being used?				
10.8	Are earthing and bonding arrangement of non-current carrying metallic parts in line with provisions of Indian Electricity Rules – 1956 amended time to time as IS: 3043?				
10.9	Have electrical part of OISD-GDN-192 and Clause No. 9.0 for Temporary installations in OISD-STD-173 been understood and followed wherever applicable?				
10.10	Are flexible wires having voltage of 240 volts above earth potential taken through				

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	PVC conduits?				
10.11	Whether portable hand lamps with a voltage rating of not more than 24 volts used with flameproof enclosures in confined spaces within columns, vessels etc?				
10.12	Have the Switches, MCBs, fuses etc. been inspected for proper ratings?				
10.13	Has Earth Leakage Circuit Breaker (ELCB) been used on the incoming side to protect against leakage of current? Is the device tested every time the work is started?				
10.14	Whether all portable appliances are provided with insulated Three pin plugs and socket arrangement?				
10.15	Whether industrial type extension boards and plug sockets are used?				
10.16	Has the electrical equipment brought to site by contractor been inspected by owner's supervisor/ safety officer for damage/cuts/abrasion etc? Is record of Insulation Resistance, wherever required being kept?				
10.17	Have standard practices for termination of conductors/ cables been followed (e.g. use of proper lugs, crimping tool, cable glands etc)? Is cable armour in continuity from feeding point to load?				
10.18	Are the Contractor supervisor and workmen well acquainted with first aid for electrical shock?				
10.19	Are the wires/ cables identifiable along their route towards the load by using colour coding and/or markers?				
10.20	Others				
11.0	**ROAD WORK**				
11.1	Whether site is barricaded and provided with warning signs including night warning lamps/ self glowing markers at appropriate location for diversion of traffic?				

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11.2	Whether mixing aggregates with bitumen is done with the help of batch mixing plants? If no, whether adequate precautions have been taken?				
11.3	Whether road rollers, bitumen sprayers, pavement finishers are driven by experienced drivers with valid driving licenses?				
11.4	Whether the worker handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate are provided with PVC hood, hand gloves rubber shoes (gum boot) with pegging upto knee joints?				
11.5	Others				
12.0	**FORM WORK, REINFORCEMENT**				
12.1	Whether form work, shuttering, shoring etc. are adequately designed and provided to erect the structure and to support the expected load?				
12.2	Whether staging (support) for shuttering is designed for loads like worker movement, impact load and other incidental loads during construction?				
12.3	Whether workers use PPEs at work site like safety shoes, gloves, helmet with chin strap, goggles and dust masks etc.?				
12.4	Whether all safety procedures are adopted while cutting rod?				
12.5	Whether proper staging and bundling is provided for supplying rods at height?				
12.6	Whether sufficient cross bracings are provided for high staging works as per design requirement?				
12.7	Others				
13.0	**CONCRETING**				
13.1	Whether the concreting area is barricaded?				

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13.2	Whether vibrator hoses, pumping concrete accessories are in healthy condition and mechanically strong?				
13.3	Whether it is ensured that no pipe line in concrete pumping system is attached to any temporary strut such as scaffolds etc.?				
13.4	Whether it is checked that safety guards around moving parts are provided in concrete mixer/ machines?				
13.5	Whether earthing of electrical mixers, vibrator etc. are provided?				
13.6	Whether entry of unauthorised person in the concreting area is restricted?				
13.7	Whether adequate lighting arrangement is made in the concreting area if working during night?				
13.8	Whether PPEs like gum boots, gloves, helmet with chin strap, goggles and dust masks etc. are being used?				
13.9	For overhead or underground work, whether form work and shuttering have been checked with respect to design?				
13.10	Whether boom placers are properly secured?				
13.11	Others				
14.0	**DEMOLISHING (DEMOLISHING BY BLAST NOT CONSIDERED)**				
14.1	Whether an initial survey carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health?				
14.2	Whether sequence of demolition is formulated and approved by competent person after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions?				
14.3	Are non-sparking tools being used, if required?				

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14.4	Is intermittent clearing operation being done to keep the area reasonably tidy and clean?				
14.5	Whether effective barricading has been provided?				
14.6	Whether Electrical and other facilities like water, oil, gas pipelines, etc. have been isolated / protected?				
14.7	Whether required PPEs like helmet with chin strap, goggles, ear plug/muff, hand gloves, safety shoes, dust mask, etc. used?				
14.8	Others				
15.0	**RADIOGRAPHY**				
15.1	Are safety precautions for handling of source as per guidelines of BARC being followed?				
15.2	Is the potency of the source being used within acceptable limits as per the BARC regulations?				
15.3	Is the area being cordoned with proper signs during radiography as per guidelines of BARC?				
15.4	Does proper place exist as per BARC regulations for storage of source / Personnel safety equipment?				
15.5	Does the radiographer have valid certificate of radiography from competent authority (BARC)?				
15.6	Is radiographer using Exposure Meter / Dosi Meter?				
15.7	Whether minimum occupancy of the premises / workplace is being ensured while radiography is in progress?				
15.8	Is permit system being followed?				
15.9	Whether Radiation Safety Officer is				

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	available at site?				
15.10	Others				
16.0	**ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS**				
16.1	Are jobs being carried out with a valid work permit only as per OISD-STD-105 "Work Permit System".				
16.2	Is smoking prohibited in all places containing combustible or flammable materials and "No Smoking" notices prominently displayed?				
16.3	Are only approved type electrical installations and equipment, including portable lamps, being used?				
16.4	Are oily rags, waste, wooden materials and clothes or other substances liable to spontaneous ignition being removed?				
16.5	Are the combustible materials properly shielded in case same cannot be removed from the area?				
16.6	Has welding screens (like metal/ fire retardant cloth/ water curtain) been put up to protect other equipment / facilities/ OWS cement ceiling/ drains in adjoining areas against flying sparks, as may be required?				
16.7	Is Gas-testing being done with the means of a calibrated Gas detection Meter prior to start of Hot work and being done subsequently at regular intervals as per the requirement and recorded?				
16.8	Are regular inspections being done of places where there are fire risks like in the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations?				
16.9	Are fire-extinguishing equipment being placed at strategic locations and are kept well maintained and inspected at suitable intervals by a competent person?				

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16.10	Are accesses to fire - extinguishing equipment such as hydrants, portable extinguishers and connections for hoses kept clear at all times?				
16.11	Are all supervisors and a sufficient number of workers trained in the use of fire-extinguishing equipment?				
16.12	Are audio means, to give warning in case of fire provided, audible in all parts of the site where persons are liable to work?				
16.13	Is there an effective evacuation plan in place so that all persons are evacuated speedily without panic?				
16.14	Others				
17.0	**EMERGENCY PROCEDURES**				
17.1	Is signaling / siren system effective?				
17.2	Is arrangement for rescuing affected person adequate?				
17.3	Are signs showing emergency exit route installed?				
17.4	Is emergency exit route clear of obstacles?				
17.5	Is communication system adequate?				
17.6	Whether emergency vehicle with driver has been provided to meet any emergency situation?				
17.7	Does any tie-up with hospitals or local doctors exist?				
17.8	Has the assembly point for workers in case of emergency been identified and earmarked?				
17.9	Has training been provided to a few workers for First Aid?				
17.10	Emergency procedure and telephone numbers are known to all and same are prominently displayed at site? (Sample				

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	compliance check)				
17.11	Whether emergency mock drills are being regularly done?				
17.12	Others				
18.0	**WELFARE FACILITIES**				
18.1	Are hygienic conditions prevailing at labour camps?				
18.2	Are First Aid facilities available?				
18.3	Does proper sanitation exist at site office and labour camps?				
18.4	Does any arrangement of medical facilities like tie ups with nearby hospital exist?				
18.5	Is proper drinking water facility available for workmen & staff?				
18.6	Are crèches provided for children (if applicable)?				
18.7	Is any proper place/canteen/restroom provided for eating food and taking rest?				
18.8	Is any place earmarked for storing / keeping clothing?				
18.9	Is adequate washing facility available?				
18.10	Does proper ventilation at working place exist?				
18.11	Others				
19.0	**GENERAL**				
19.1	Are illumination levels at workplace and passages adequate?				
19.2	Is communication system adequate?				
19.3	Are display and caution boards provided at strategic locations?				
19.4	Are road barriers being used for blocking any roads/passage?				

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19.5	Has the structure been adequately secured against storm/high winds during construction/ erection?				
19.6	Are the equipment properly earthed?				
19.7	Are vehicles being checked like brakes, oil, lights etc. on regular basis?				
19.8	Is compressed air being used only for its intended purpose and not for any other purpose?				
19.9	Are only proper clothes and not loose clothes being used while working around machinery?				
19.10	Are nails or other sharp objects being removed or bent?				
19.11	Are machine guards over moving parts of machinery such as coupling, pulley, wheel etc. installed?				
19.12	Whether after maintenance of machinery the guards are securely fitted before putting into operation?				
19.13	Are working platforms / gangways provided with hand rails & toe guards?				
19.14	Are swing platforms provided with chains & secured adequately when not in use?				
19.15	Are the approaches to work sites being maintained & kept clear of obstacles?				
19.16	Whether engines of equipment entering into the operating area have exhaust and muffler system with approved spark arrestor?				
19.17	Whether vehicles/engine driven equipment, electrical equipment and tools used are certified?				
19.18	Whether contractors inform his workers about hazards and safe procedures?				

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19.19	Whether sufficient care is taken so that spark do not go outside working enclosure & falls below?				
19.20	Whether contractor's qualified / trained supervisor is present?				
19.21	Whether all exhausts of engines are provided with approved type of flame arrestors and exhaust is not facing toward the place where the workers are working?				
19.22	Others				

Signature of the Auditor

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Annexure-XVI to SCC
Eligibility Criteria for Bank for PBG/ABG

Bank Guarantee Clause

As per BPCL Standard policy on acceptance of Bank Guarantee (BG) , BG's as per following criteria will be accepted:

Criteria for Acceptance of BG

BG Value	Stipulation
Upto INR 1 Crores	Bank Guarantees from any Scheduled bank (including nationalised banks, other scheduled commercial banks, scheduled cooperative banks and scheduled regional rural banks) as appearing in the second schedule to the RBI Act 193 Shall be acceptable.
Greater than INR 1 Crores	Bank Guarantee which are issued by banks having long term issuer rating of "A2" from Moody's or equivalent from Fitch and S&P in case of the foreign bank and long-term issuer rating of at least "AA" from CRISIL or equivalent from CARE, ICRA and Indian rating in case on Indian Bank, shall be acceptable. In case rating for a bank is available from more than one rating agency, the lowest such rating shall be considered. Illustrative list of banks meeting the stipulated criteria as on 02.06.2025 are attached as annexure 1.

Annexure I

List of banks meeting the stipulated criteria as on 02.06.2025

Sr No.	Name of Bank	Category of Banks
1	AU Small Finance Bank Ltd	Indian Bank
2	Axis Bank Ltd	Indian Bank
3	Bank of Baroda	Indian Bank
4	Bank of India	Indian Bank
5	Bank of Maharashtra	Indian Bank
6	Canara Bank	Indian Bank
7	Federal Bank Ltd	Indian Bank
8	HDFC Bank Ltd	Indian Bank
9	ICICI Bank Ltd	Indian Bank
10	IDBI Bank Ltd	Indian Bank
11	IDFC First Bank Ltd	Indian Bank
12	Indian Bank	Indian Bank
13	Indian Overseas Bank	Indian Bank
14	IndusInd Bank Ltd	Indian Bank
15	Karur Vysya Bank Ltd	Indian Bank
16	Kotak Mahindra Bank Ltd	Indian Bank
17	Punjab National Bank	Indian Bank
18	State Bank of India	Indian Bank
19	UCO Bank	Indian Bank
20	Union Bank of India Ltd	Indian Bank
21	Abu Dhabi Commercial Bank PJSC	Foreign Bank
22	Bank of America NA	Foreign Bank
23	Bank of Nova Scotia	Foreign Bank
24	MUFG Bank Ltd	Foreign Bank
25	BNP Paribas SA	Foreign Bank
26	Shinhan Financial Group Co Ltd	Foreign Bank
27	Citibank NA	Foreign Bank
28	DBS Group Holdings Ltd	Foreign Bank
29	Hongkong & Shanghai Banking Co	Foreign Bank
30	JPMorgan Chase & Co	Foreign Bank
31	Mizuho Bank Ltd	Foreign Bank
32	Westpac Banking Corp	Foreign Bank
33	Industrial & Commercial Bank of China	Foreign Bank
34	Credit Agricole SA	Foreign Bank
35	Cooperative Rabobank UA	Foreign Bank
36	Doha Bank QPSC	Foreign Bank
37	Qatar National Bank QPSC	Foreign Bank
38	United Overseas Bank Ltd	Foreign Bank
39	KEB Hana Bank	Foreign Bank
40	Industrial Bank of Korea	Foreign Bank
41	First Abu Dhabi Bank PJSC	Foreign Bank
42	Emirates NBD Bank PJSC	Foreign Bank
43	NatWest Markets PLC	Foreign Bank
44	Bank of China Ltd	Foreign Bank
45	CTBC Bank Co Ltd	Foreign Bank

Note:

1. The above list of banks is based on the credit rating as on date (Source: Bloomberg)
2. In case of any discrepancy/subsequent upgrade in credit rating, user department can contact Treasury for clarification.

ANNEXURE-XVII TO SPECIAL CONDITIONS OF CONTRACT

ENERGY POLICY

Energy Policy

We at Bharat Petroleum Corporation Limited, Bina Refinery (BPCL-BR) are committed to continual improvement in Energy performance and Energy Management System, which shall be demonstrated by:

- **Proactively** anticipate & assess risks and opportunities, address them through short and long-term objectives and implement mitigation plans.
- **Ensuring** effective Management of Energy, Information and Resources to achieve Objectives & Targets and Complying with all applicable legislation and other requirements.
- **Strengthening** purchase of energy efficient products & services by utilizing latest technology to improve our energy performance.
- **Monitoring** & Controlling energy consumption through well-structured reviews.
- **Attaining** participative culture of energy conservation by creating awareness through training.

Date : 1st July 2023

Place : Bina

Chacko M Jose

Executive Director - BR

ANNEXURE-XVIII TO SPECIAL CONDITIONS OF CONTRACT

DISCONTINUATION OF HYDRA CRANES WITHIN BINA REFINERY

Annexure XVIII

DISCONTINUATION OF HYDRA CRANES WITHIN BINA REFINERY PREMISES

The present Hydra Cranes can be substituted with suitable/equivalent hydraulically operated cranes that are equipped with rear mounted boom and out rigger supports. Some of the models having these features are mentioned below for your easy reference:

Sr. no.	Manufacturer	Models
1	Escort Construction Eqp. Ltd(ECEL)	TRX Series :K10,F15,TRX 1651,TRX 2319, MAC 1214
2	Action Construction Eqp. Ltd. (ACE)	FX 120,FX 150, 15XWE ,15 XWF, Rhino 110 FC

All the contractors are requested to take cognizance of the above, and arrange for alternate equipment, to carry out various jobs inside Bina Refinery.

Please ensure strict compliance failing which suitable action shall be taken as deemed fit.

ANNEXURE – XIX
TO
SPECIAL CONDITIONS OF CONTRACT

[LABOUR COMPLIANCE & SPECIFICATIONS/GUIDELINES FOR LABOUR WELFARE FACILITIES AT CAMP AND AT PROJECT SITE]

LABOUR COMPLIANCE

1. On the award of a contract, the contractor shall contact BPCL HR department to understand the requirements for onward process/ procedure for BPCL HR related activities and submit details/ contact number(s)/ email id(s) of their point of contact and authorization letter (for signing any BPCL HR related compliance document) of the person named so.

2. The scope of obligations of the contractors underlined also includes those of its subcontractor(s) and the contractor shall have the sole ownership and accountability for the same.

3. **Adherence to Statutes, Regulations, Schemes, Rules, BPCL's rules and procedures**: The contractor shall undertake to ensure due and complete compliance with respect to all Statutes, Regulations, Schemes, Rules, BPCL's rules and procedures etc. (which may be amended from time to time) whether of Central Govt. or State Govt. or any other competent authority applicable to the contractor and or employees employed or whose services are otherwise availed of by contractor or sub-contractor appointed by such contractor. Such laws shall also include Minimum Wages Act, 1948, Contract Labour (Regulation and Abolition) Act,1970, Employees State Insurance Act, 1948. Employees' Compensation Act, 1923, Payment of Gratuity Act, 1972, Provident Fund & Miscellaneous Provisions Act, 1952, Payment of Bonus Act, 1965, Apprentices Act,1961 and all other applicable Act, laws, rules, regulations and orders as may be in force from time to time. The Contractor must ensure strict compliance with respect to all applicable Acts.

4. The Gate Passes for contractors' employees are processed through Contract Man Management System (CMMS) online portal. The contractor shall fill in details pertinent to the LOI/ LOA/ PO, Labour license (if applicable), accidental insurance (Employees State Insurance Act, 1948/ Employees Compensation Act, 1923 policy details) and personal details of contractors' employees in CMMS through its login credential. The contractor shall contact BPCL HR department to understand the requirements and process.

5. Documents related to the contractor's employees to be submitted to BPCL and or uploaded in CMMS:
   5.1. Character certificate (Police verification)
   5.2. Medical fitness certificate
   5.3. Insurance policy (Pehchan Card under ESIC/EC policy/Group Personal Accident (GPA) as applicable)
   5.4. Photo Id (preferably Aadhar)
   5.5. Education/ Experience certificate (as required)
   5.6. Bank account, mobile number and UAN details; if not available, after the first month of the running of the contract
   5.7. Any additional requirement will be communicated and shall be required to be complied

6. For Bina location, medical examination of the employees is to be done mandatorily at BPCL (VK BR) hospital, located in BPCL Township, Bina as per the applicable charges. The gate pass is issued only those who are declared medically fit. Medical fitness of employees

involved in the high-risk jobs like confined space entry, inert space entry, work at height etc. is reassessed for specific requirements (on form-32) at Occupational Health Centre.

7. BPCL has the sole proprietorship of the Gate Passes issued to the contractors' employees and the contractor is obligated to return all the gate passes issued to the contractor. In case of non-submission of the Gate passes / lost Gate passes / damaged Gate passes suitable amount per gate pass will be deducted by BPCL. Also, the case of non-submission of the Gate passes / lost Gate passes shall require the contractor to lodge complaint at the local Police Thana and submit a copy of the same to BPCL Security.

8. **Confirmation to BPCL HR department of Compliance under various Act applicable:** It shall be the responsibility of the Contractor to confirm to BPCL HR of conformance to statutory compliances under various Acts applicable and submit the required documents to BPCL HR in CMMS through its log in credentials, on monthly basis. The contractor is required to contact BPCL HR department to understand the requirements and process.

   8.1. Contractor shall ensure timely payment to employees, remittance of PF & Pension & ESIC contributions and maintain statutory documents & registers under various applicable Acts.
   8.2. The checklist of the documents and formats etc. to be maintained and submitted to BPCL can be obtained from the BPCL HR department after the award of contract.
   8.3. On submission of the aforementioned documents, BPCL HR will inspect and issue 'HR Clearance Certificate'. Clearance of invoices shall be subject to completion of all labour compliances and getting HR Clearance Certificate from BPCL HR.

9. **Inspections/ Audits:** The contractor shall maintain and keep a copy of statutory documents at site and shall present itself at the designated time and venue with the required documents as when demanded by the BPCL and or any statutory authorities.

Specifications for Labour Camp

1 Purpose

To establish a minimum standard for the provision and maintenance of living conditions for the wellbeing and welfare of the workforce in construction projects of BPREP. The document aim to cover the norms apart from the existing provisions incorporated in relevant tenders.

2 Scope

This standard covers minimum basic requirements of design, construction, installation, and maintenance of temporary workers' housing quarters (Labor Camp) on construction site.

The contractor shall provide, free of cost temporary accommodation as the regulatory requirement to all workers engaged in the Project.

This document aims to provide the Project Teams and Contractors with guidance on the planning, design, construction, operation and decommissioning of Construction Camps in a sustainable way:

- Create adequate, respectable living conditions for the Project construction workforce.
- Maximize value over the entire lifecycle of the construction camp (maintenance, cleaning, waste management, energy and water usage management) and minimize footprint.
- Consider ethnic, religious and cultural differences and managing those.
- Create a secure, safe, and hygienic environment, including the logistics.
- Minimize impact on the local communities.
- Lower disease incidence and/or food poisoning outbreaks.
- Promote Health & Wellness and create a facility and community that exudes care for people.
- Maximize opportunities for beneficial use of the site, infrastructure, or parts thereof after project execution.
- It is assumed in this document that the facilities will be intended for single or bachelor status occupancy only unless specified differently.

This document does not cover permanent residential areas, neither temporary nor permanent office units nor buildings located inside project area.

3 Responsibilities

Following are the responsibilities of contractor:

- Providing Labour camp as per the norms listed in the tender document.
- Deploying manpower/ stewards/ managers and training workers as per contract norms for inspection & ensuring compliance

Maintaining records of labor complaints and submitting owner for record of compliance.

4 General guidelines for location of labor camp:

(To be read in Conjunction with labor camp layout, Appendix I)

- CONTRACTOR shall arrange land for construction of labour camp outside the Refinery. CONTRACTOR shall ensure that all workers stay in the labour camp. The workers having permanent address within 10 kms radius of the refinery location can be exempted from camp accommodation. For subject exemption, CONTRACTOR shall maintain record of all the workers with their name, age, local address, and permanent address along with copy of Aadhar card.
- CONTRACTOR shall develop and maintain all necessary facilities in labour camp like power, water, hutments, sanitation facilities, medical facilities, drainage, transportation facilities, etc. as per the norms mentioned in the tender document.
- Land for labour camp will be arranged by contractor following all local authorities rules and regulations. Camp must be located on elevated ground which is less prone to floods.
- Ensure that the land is not marshy in nature. Locality of the camp should be so selected that that there is no rift between the habitats of the camp and nearby community. Land under dispute shall not be selected for labor camp. If possible, commuting for shopping or to work shall be minimized.
- If there is danger of intrusion of snakes, carbolic acid must be spread around the labor camp and an area up to five meters from the buildings shall be cleared of any kind of shrubs, holes etc. that can house snakes and insects and it shall be maintained by periodic removal of vegetation.
- Availability of underground public utility services like electricity cables, water pipelines, gas pipelines and telephone / other lines shall be assessed and proper approval shall be taken from the authorities before excavating the land.
- If passing of overhead high-tension electric line over the labor camp cannot be avoided then a safe distance (minimum 3-5 meters) from the wires shall be ensured.
- Structures in the labor camp should be designed, constructed accordingly and their structural stability certificate shall be obtained.
- Water shall not be allowed to stagnate, and water generated shall be collected, treated and recycled.
- A small grocery shop shall be developed inside the labor camp.

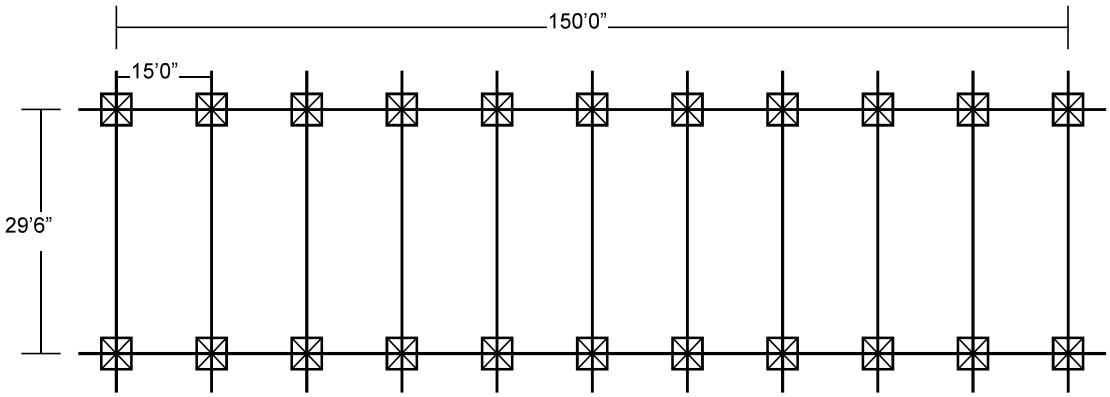
5 Norms for labor camp

5.1 Housing and Accommodation

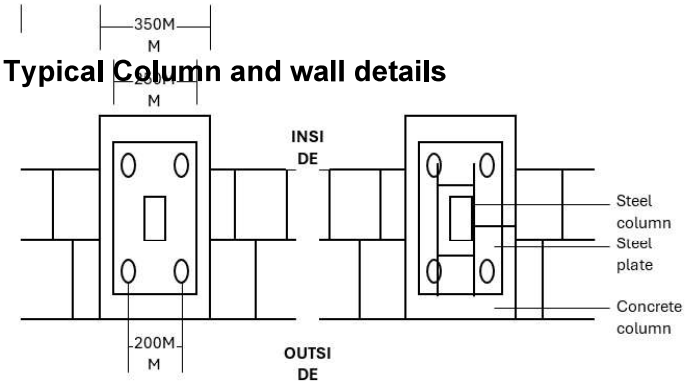
- The housing shall be in the form of weather protected, prefabricated houses or constructed with hollow blocks. Row type sheds constructed with Structural Steel structure and Prefabricated Aerocon Panels & GI sheet roofing with columns, trusses and purlins and thermocol false ceiling.

- The contractor shall be responsible for demolishing the camp, clear the area and hand over the land to the landowner post project completion.
- Contractor shall allocate everyone a minimum of 25 square feet of accommodation space.
- Accommodations should be structured to house four persons per unit, utilizing bunk beds to maximize the use of vertical space.
- Each room with bunk bed setup should be equipped with a fan and a window to ensure proper ventilation, and lockers should be provided for personal storage. There shall be provision of a meshed window, 3 feet x 2 feet in size, located 6-9" below the ceiling on the common wall for ventilation.
- The height of ceiling shall be a minimum of 10 feet. If bunker beds are provided, the ceiling shall be a minimum of 4 feet above the top bunker bed. In case of bunker beds, no ceiling fans are allowed, only wall mounted fans shall be permitted.
- Provision of hooks in rooms @ 5ft height from the floor for tying the mosquito nets shall be ensured.
- Additionally, each bed should be furnished with a suitable mattress to ensure comfort and support for the occupants.
- Contractor shall provide for family rooms of approximately 12*10 square feet area in the ratio of 20:80 bachelor accommodation. The family accommodation shall be provided in the same camp area, separated by a barricading.
- Maximum 3-4 camps with 5000-8000 workers per camp may be considered for better management of facilities.
- Proper signages shall be installed at all turns and junctures to facilitate easy movement of habitants.
- Safe electric fitting with sufficient switches and plugs shall be provided. Every room shall have one tube light or LED, one fan and minimum 3 plug points. If bunker beds are used, number of light, fan and charging points shall be increased accordingly. ELCB of proper rating shall be provided for Electrical safety.
- The rooms and ceiling should be painted in light (preferably white) color for better illumination.
- The flooring should be made of Plain Cement Concrete.
- Every room shall have a window with grill and door with lock and key.
- Accommodation for bachelors and families shall be separate.
- Plinth of the rooms shall be approximately 300mm above the ground surface.

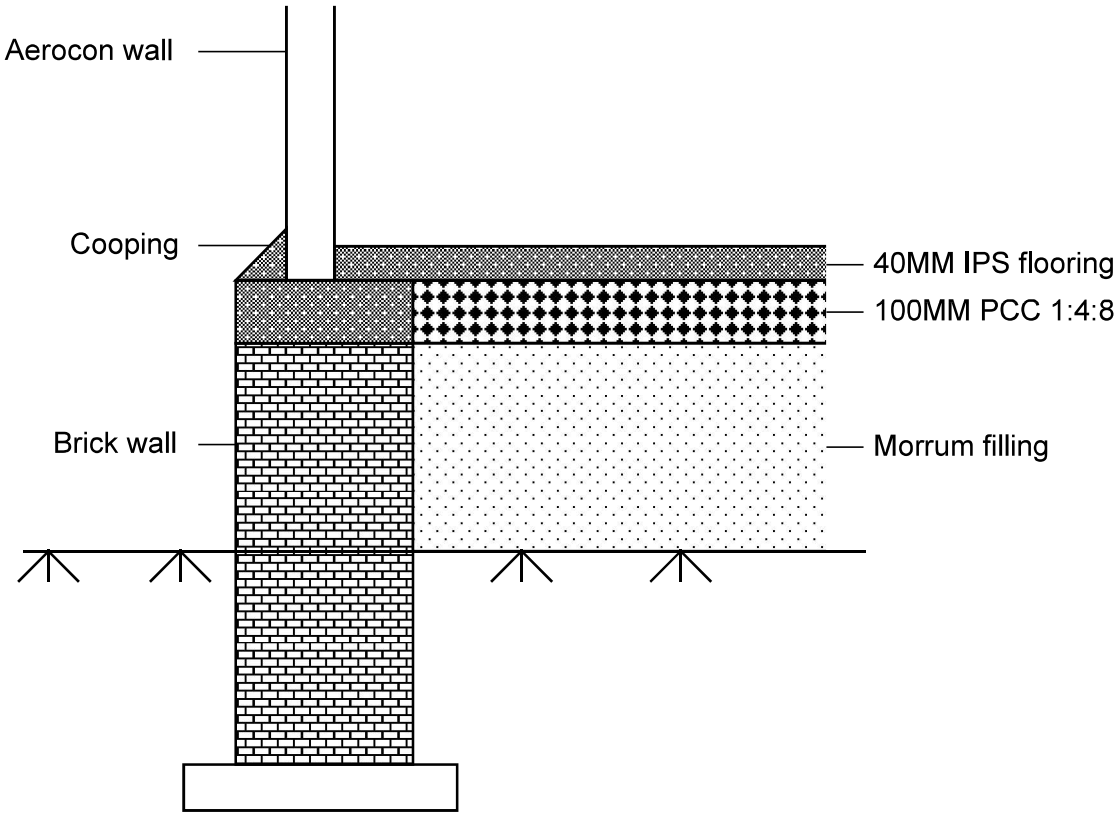
Labor quarters footing drawing



Typical Column and wall details



Typical Flooring details



Note: Details provided are typical in nature and for depiction only. Contractor shall design the structures as per standards and stability certification shall be provided.

5.2 Hygiene and Sanitation

Washrooms:

- Contractor shall ensure segregated water closets for men and women, adhering to below ratio: .
    - 1 for up to 20 persons
    - 2 for 21 to 45 persons
    - 3 for 46 to 70 persons
    - 4 for 71 to 100 persons
    - From 101 to 200 persons, add at the rate of 3 %. For over 200 persons, add at the rate of 2.5 %.
- Additionally, urinals shall also be installed following a ratio of 1:40.
- Washrooms with brick wall, tile flooring and standard sanitary fittings shall be provided for labour camps.
- Toilets are to be located within 100m of home location at camp
- Essential to maintaining cleanliness and hygiene, disposable bags and adequately covered dustbins must be provided in all toilet facilities.
- Furthermore, ensuring that every washroom is stocked with handwash, and soap will promote hygiene and prevent the spread of disease. These improvements are essential for providing a safe and dignified environment for all workers at the site.
- To further enhance the sanitation management, the installation of small-scale Sewage Treatment Plants (STPs) in all camps is required. There should not be any untreated discharge to the storm water.
- Proper levelling/ pavement of roads is to be ensured to avoid water logging.

Washing/Bathing Area:

- Contractor shall ensure segregated bathrooms/ washrooms for men and women, adhering to below ratio:
    - 1 for up to 20 persons
    - 2 for 21 to 45 persons
    - 3 for 46 to 70 persons
    - 4 for 71 to 100 persons
    - From 101 to 200 persons, add at the rate of 3 %. For over 200 persons, add at the rate of 2.5 %.
- The bathing area shall be constructed on P.C.C floor of area 24 feet x 24 feet with 5-bathroom block on each side and 2 feet gap on each side.
- The water shall be pumped to the portable tank lying on the structurally stable structure above the ground.
- The capacity of tank shall be suitable for 50 liters/person/day.
- The bathroom shall be completely covered with brick wall on 3 faces and gate on the 4th face.
- Size of each bathroom shall be 4ft x 4ft x 8 ft (height) fixed with a door.

- Labors shall be educated not to throw the shampoo pouches/soap cover in the bathrooms & proper screen shall be fixed to prevent all these solid wastes going into grey water treatment plant.

5.3 Water Supply

- To address drinking water issues, it is imperative to ensure a supply of 20-30 liters of water per person per day, specifically allocated for drinking and cooking purposes.
- Contractor shall ensure a daily water provision of 8-10 liters per person through water stations.
- Additionally, water coolers fitted with Reverse Osmosis (RO) systems shall be installed at all water stations to provide clean, safe drinking water at camp and site. The water used for cooking and drinking purpose shall be tested and potable as per IS 10500. Water tapes shall be push button type (as used in railways) in the drinking water area
- Recommended water supply for purposes other than drinking and cooking to be provided to ensure a minimum of 100 liters per person per day and a wastewater treatment plant of suitable capacity and design shall be established at each camp.

5.4 Grey Water and Sewage Treatment Plant

- Bathing and washing wastewater is termed as grey water and it is encouraged to treat the same in the grey water treatment plant, the treated water shall be reused for bathing and washing (by maintaining pH value), dust suppression/ green belt watering at the site.
- Grey water shall be treated in Grey water treatmentunit and sewage shall be treated in sewage treatment plant before any discharge. Grey water and sewage treatment plant shall be provided by contractor for his labor camps. Both the units shall be designed and implemented as per labor camp capacity following all environmental and statutory guidelines after taking necessary approval from BPCL/ EIL.

5.5 Fresh Water Tank

Sintex (3 layered) water tanks of required capacity shall be provided to store the fresh water, considering 2 days' storage. They should be located close to the main gate. An electric pump and necessary plumbing to pump the water to other areas shall be provided.

- A designated common kitchen shall be provided in every camp, ensuring that food preparation facilities are accessible to all residents. Cooking area with a minimum area of 600 sqft shall be setup and be separated from other facilities
- Openings for exhaust and cross ventilation shall be provided.
- The food preparation area shall be equipped with fire extinguisher for safety.
- Adequate storage with lock and key shall be provided to all the gangs for storage of grocery and vegetable.
- Pest control with anti-rodent arrangements shall be conducted regularly in the cooking area.

- If LPG is used as fuel, periodic checking of supply pipe/ regulator shall be done for leakage detection
- Fuel storage: The fuel storage area shall be close to the cooking area which should be equipped with fire extinguishers and necessary safety arrangements. People shall be trained to use fire-extinguishers. Minimum area of fuel storage shall be 100 sqft.
- No kitchen shall be allowed at Project site, food packets to be delivered to the workers by respective contractors. The food distribution by respective contractors needs to be pre-planned for additional delivery during early start and late finish months.
- Provision shall be made inside camps for workers to cook food as per choice. Cooking inside the accommodation rooms shall be strictly banned.
- Kitchen shall be provided in family rooms by using space of verandah.
- Dining area shall be near to the cooking area and shall be minimum 20X40 feet for 100 workers. Dining area capacity shall be 25% of the total wokers deployed by contractor.
- The dining area
- Fixed tables and sitting arrangements should be made preferably made of kadappa stone tables and benches.
- The area shall be sufficient for 80 to 100 labors at a time.
- Hand-wash area with drainage shall be provided.

  Covered Food-waste bins shall be kept near the dining area & waste shall be disposed on daily basis to avoid breeding of flies/mosquitoes.

5.6 Utensil Washing Area

- Utensil washing area shall be near to the cooking area and shall be minimum 20X20 feet.
- Utensil washing area shall be provided with 10 taps to wash the utensils.
- The wastewater stream from utensil washing area shall flow to gray water treatment plant after screening solids from the kitchen water.
- The screened solids shall be diverted to the waste disposal area, where food waste is disposed. Contractor should make proper arrangement for disposal of food waste/ other solid waste meeting all statutory and environmental compliance.

5.7 Weather conditions at camps

- Fans and proper ventilation shall be ensured in all camp accommodation by the respective contractors.
- Uninterrupted supply of cold water by sufficient industrial water coolers (stations) shall be ensured during the peak summer months.
- Provision of heaters/ blowers needs to be ensured at camp to cater to extreme cold.

5.8 Worker Transportation

- Comfortable seats in good condition shall be always maintained in the buses.
- Regular audits may be carried out by designated representative to ensure no overcrowding of buses.

- Site management shall ensure that parking at site is planned sufficiently to ensure no traffic because of buses at any time.
- Workflow shall be set-up by the respective contractors to ensure proper queuing of workers for getting in and getting out of the buses.

- **Provision of Transportation Services**

  The Contractor shall provide adequate transport facilities for all workmen employed at the construction site. Contractor shall provide proper mode of transport in form of passenger Bus service for transporting workmen from Labour camp to entry gate and from entry gate to worksite. The facilities shall ensure timely onboarding, transportation to the site, and return to the designated pick-up points within the stipulated timeframes. This is to ensure the timely, efficient, and safe transportation of workmen to and from the work site, thereby minimizing downtime, improving productivity, and maintaining steady job progress.

- **Capacity and Frequency of Transport**

  a. The transportation facilities shall be organized to ensure that each bus caters to minimum 50 workers per trip.
  b. The number of buses and trips required shall be determined by the total number of workmen and their work schedules to avoid overcrowding or delays.

- **Prohibition of Overcrowding**

  The Contractor shall ensure that all transport vehicles comply with applicable safety regulations and are not overcrowded. Adequate seating and standing arrangements shall be made, ensuring the comfort and safety of the workmen.

- **Compliance with Time Management**

  a. The transport schedule shall align with the work site's operational hours to guarantee that all workmen reach the site punctually.
  b. The downtime due to transportation delays shall be minimized, and any repeated failure to meet this standard may result in penalties or deductions, as specified in the contract.

- **Monitoring and Reporting**

  The Contractor shall maintain a log of transport schedules, vehicle capacity, and the number of workers transported. This record shall be subject to periodic inspection by the Owner or their representative.

- **Health and Safety Standards**

The Contractor shall ensure all transport vehicles are in good working condition and comply with health and safety regulations. Drivers shall be licensed and trained to handle workmen transportation professionally.

- **Non-Compliance:**
  Improper mode of transport (deploying small vehicles , pick up vans , construction material carrier etc) will be considered as unsafe act and suitable penalty for unsafe act will be imposed.

5.9 Cultural Amalgamation and Recreation

- Absence of recreational facilities on site can affect the morale and overall well-being of workers. Site management shall incorporate an open space measuring 100 X 150 meters in each camp specifically designated for sports and recreational activities.
- The decision regarding the specific facilities to be included in this space should be made by the contractor, based on the preferences and interests of the workforce.
- A recreation room of minimum 20*20 ft shall be provided for entertainment of labors
- The contractor needs to organize theme-based skits with professional agencies related to safety, unity, rights and duties, de-addiction, etc. once every two months.
- It shall be ensured that all the festivals are organized at camp and site to encourage bonding between workers.
- Training and awareness through slogans in different languages shall be ensured throughout the camp and site area.
- The camp management team shall comprise of representatives from different regions to ensure open communication with workers from different areas of the country.
- A TV (minimum 40 inch) with data cable connection shall be provided & be used for entertainment and showing informative videos on HSE/ general topics.
- Camp Head shall take care of the discipline in TV room and food, bidi, gutka shall not be allowed inside the TV room, also labors shall not be allowed to sleep inside the TV room
- Appropriate no of big floor mats of minimum 10ft*10ft shall be provided for watching the TV.

5.10 Medical Facilities

- Medical check-up report needs to be mandatorily submitted by the contractor for all the workers before issuance of ID card.
- Site management shall ensure primary medical facilities to all workers through OHCU.
- An ambulance through tie up with nearby hospitals should be available on site at a ratio of one per 2000 workers. If the workers are less than 2000, minimum one ambulance to be maintained. A first aid center with adequate paramedics should be present next to the camp administrator's office and the area of this room shall be minimum 100 sqft. In case of female workers, female first aiders shall be made available.

- Contractors shall equip each dining area (within HSSE hub) with a first aid box, maintaining a ratio of one box per 150 workers, to ensure first aid supplies in case of emergencies.
- Furthermore, organizing medical camps every two months and conducting an annual health check-up for all workers will help in early detection and management of potential health issues.
- Mandatory Emergency First Response training shall be imparted to supervisors once every year.
- De-addiction drives shall be organized every two months to provide education, support, and resources to help workers overcome their addictions.

5.11 Safety and security

- Security measures must include installation of a minimum of six closed-circuit television cameras in each camp, with capabilities to record continuously for 30 days to enhance safety and monitoring.
- Every labor camp shall have security cabin at the main gate to guard and to ensure safe passage of people, goods and belongings. The security cabin should typically be 6 feet x 6 feet.
- A security guard shall be deployed (24x7) at the main gate.

5.12 Waste Disposal Area

- The waste disposal area shall be cleaned daily, and authorized vendor shall be engaged to dispose the collected waste.
- Bio-gas plant and food-waste composting shall be encouraged for energy conservation and for food waste management in large labor camps (more than 1500 labors). For specific details on size please touch base with Corporate HSE department.

5.13 Emergency Assembly Area

- Emergency assembly area shall be clearly marked and should be easily accessible to everyone in the labor colony.
- Area: should be able to accommodate the full occupant load of the premises / area (as a thumb rule, not less than 2.25 square feet per person @ 1.5x1.5 feet)
- A notice board displaying the emergency contact numbers shall be provided in this area.
- Each occupant shall be briefed on the location of Emergency Assembly Area, first-aid room and their actions in case of an emergency

5.14 Grocery Shop

- Provision for a grocery shop of 10*10 Sq ft shall be made inside the labor camp, the shopkeeper must keep daily use items for labors like soap, washing powder, toothpaste,

Hair Oil, comb, shampoo etc. Kitchen items like cooking oil, rice, dal, wheat flour, spices etc shall be available with the shop.

- Shopkeeper may keep a provision for preparation of tea and ready to eat snacks, biscuits etc based on the requirement, but cooking shall not be permitted inside the grocery shop.

5.15 Creche

- In case of 50 or more female workers, a creche facility of minimum 20*10 Sqft shall be provided inside the labor camp.
- Children below 6 years shall be accommodated in creche and a trained caretaker shall be appointed to take care of children. Proper nutrition, healthcare, hygiene and primary education shall be ensured for the children by the caretaker.

5.16 Electric Room

- Preferably, labor camp electrification shall have solar energy as the source of electric energy and a small DG set as back-up for emergencies.
- Electric room shall preferably be of adequate size to accommodate the DG and panels etc. In general, it may be of 200 sqft size with brick work, concrete flooring and plaster. Earthing pits shall be a part of it. If required, cable trays shall be provided to align the cables.
- The roof, floor and walls shall be leak-proof to avoid any leakage / dampness.
- It shall be equipped with firefighting equipment and with lock & key.
- Earth resistance shall be checked on weekly basis and no. of earth pit shall be done
- In case of solar powered labor camp, room to store batteries of energy bank shall be provided.

5.17 Camp Head Room

- An office room for the camp administrator shall be provided near the entrance gate.
- This office room shall be minimum 100 sqft.
- Provision of electrical fittings & fixtures (lights & fan) as well as a table, 4 chairs and cupboard shall be provided.
- A notice board in lock & key shall be provided outside the camp boss room but displaying notices, information etc.

6 Guidelines on compliance of norms

6.1.1 Audit

- **Inspection Protocol:** A third-party audit appointed by EIL/BPCL will be conducted monthly. Any deficiencies identified must be corrected and reassessed as per Attached annexure-I for penalty matrix

- **Audits and Feedback:** Surprise visits will be conducted by the owner's human resources, legal, IR, or safety teams, or by the PMC, to gather feedback on labor accommodation.

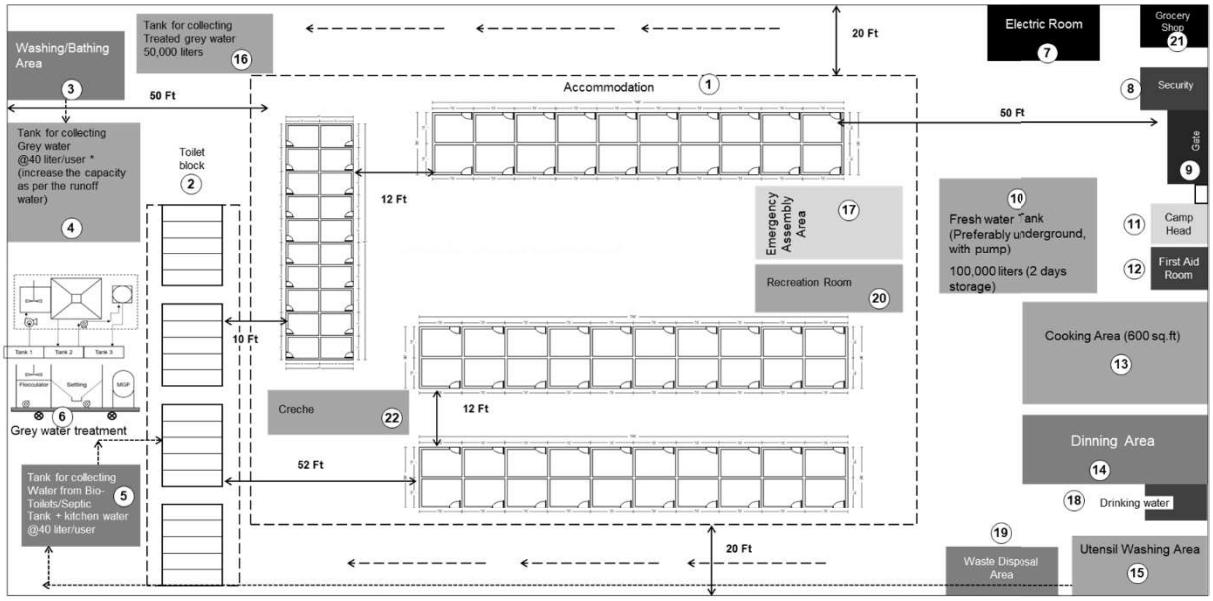
6.1.2 Reporting

- **Complaint Mechanism:** Each contractor's office must have a provision for laborers to submit complaints. The contractor is responsible for maintaining records of these complaints and resolving complaints in a timely manner.
- **Incident Reporting:** The PMC is tasked with verifying documents and informing the owner of any incidents. Human resources from the owner will report these incidents to the factory inspector, DISH, and PESO.

6.1.3 Pain - Gain

- **Non-Compliance Penalties:** The concerned authority from the owner/ PMC will impose penalties for each non-compliance issue, as per attached Annexure-I.
- **Appreciation and Rewards:** Appreciation letters will be awarded to the best contractor.
- **Recognitions** such as Safety/Quality person of the month, quarter, and year would be awarded to the contractors based on their performance in these domains.
- **Exclusive high tea sessions** with the leadership may be organized to motivate the manpower
- **Wall of fame** for outstanding laborers will be maintained and the names chosen by the auditing team.

Depiction for Scheme for Labor camp establishment


Washing/Bathing Area
3
Tank for collecting Treated grey water 50,000 liters
16
50 Ft
Tank for collecting Grey water @40 liter/user * (increase the capacity as per the runoff water)
4
Toilet block
2
Grey water treatment
6
Tank for collecting Water from Bio-Toilets/Septic Tank + kitchen water @40 liter/user
5
Accommodation
1
20 Ft
12 Ft
10 Ft
12 Ft
52 Ft
Creche
22
Emergency Assembly Area
17
Recreation Room
20
Electric Room
7
Grocery Shop
21
Security
8
50 Ft
Gate
9
10
Fresh water Tank (Preferably underground, with pump)
100,000 liters (2 days storage)
11
Camp Head
12
First Aid Room
Cooking Area (600 sq.ft)
13
Dinning Area
14
18
Drinking water
19
Waste Disposal Area
Utensil Washing Area
15
20 Ft

Welfare facilities for Labour at Site

1. Toilet/ Urinal:

- Contractor shall ensure segregated water closets for men and women, adhering to a ratio of 1:20. Additionally, urinals shall also be installed following a ratio of 1:40.
- Washrooms with brick wall, tile flooring and standard sanitary fittings shall be provided in Process units (in ECU, PP/BU, etc. areas for longevity) , whereas portable washrooms may be provided in other areas at site (as mentioned in the plot plan shared in tender)
- Toilets are to be located within 200m of work zone at site (<5 mins walk).
- Essential to maintaining cleanliness and hygiene, disposable bags and adequately covered dustbins must be provided in all toilet facilities.
- Furthermore, ensuring that every washroom is stocked with handwash, and soap will promote hygiene and prevent the spread of disease. These improvements are essential for providing a safe and dignified environment for all workers at the site.
- To further enhance the sanitation management, the installation of small-scale Sewage Treatment Plants (STPs) in all camps or, alternatively, the use of septic tanks is recommended. There should not be any untreated discharge to the storm water.
- Proper levelling/ pavement of roads is to be ensured to avoid water logging.

2. Drinking Water:

- Contractor shall ensure a daily water provision of 8-10 liters per person through water stations.
- Additionally, water coolers fitted with Reverse Osmosis (RO) systems shall be installed at all water stations to provide clean, safe drinking water at camp and site. The water used for drinking purpose shall be tested and potable as per IS 10500. Water tapes shall be push button type (as used in railways) in the drinking water area

3. Food Shelters:

- Contractor shall establish dining halls (multiple small dining halls if needed) with capacity to accommodate 25% of total workforce at that hall.
- Everyone shall be allotted a space of 20 square feet to ensure comfort while dining.
- Additionally, the area shall be equipped with coolers and fans to maintain pleasant temperature, as well as fly killers to enhance sanitary conditions, ensure dignified and hygienic environment.
- The area including the dining hall may be designated as HSSE hub and shall include drinking water, hand wash facility, rest area, toilets and first aid facility.

- Covered Food-waste bins shall be kept near the dining area & waste shall be disposed on daily basis (at designated locations) to avoid breeding of flies/mosquitoes. Food waste shall be utilized for bio-gas generation and manure production

4. Weather conditions

- Adjustment of work schedule to include a 3–4-hour lunch break during the peak summer months, with an option for adjusting the same through an extended early start or finish, will help minimize exposure to peak temperature hours.
- It is recommended to provide a minimum of 20 square feet of shaded space per person, ideally located adjacent to the dining area. This can be achieved through the installation of tents made of fire retardant materials, which offer effective protection against the sun.
- Additionally, equipping these areas with fans that utilize atomized water or mist sprays will further help in reducing the temperature and providing comfort to the workers.
- Site management shall ensure properly laid out drawing in the tender documents, clearly showing the locations of shaded areas, water coolers, and washrooms.
- Provision of hydration supplements (ORS, Glucose) to mitigate dehydration during hot weather shall be ensured.
- Uninterrupted supply of cold water by sufficient industrial water coolers (stations) shall be ensured during the peak summer months.
- Towels need to be provided to workers on site to protect from harsh sun during summers.
- Provision of heaters/ blowers needs to be ensured at site to cater to extreme cold. Bonfires in site area shall be strictly prohibited to ensure safety and prevent hazard.

Note: Please refer Annexure-I for non-compliance Penalty

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Non- compliance penalties against Labour facilities

Areas	Provisions/ sub areas (as per specifications in tender norms)	Timeline for compliance post inspection (days)	Penalty for each instance of non-compliance post timeline given at inspection (in INR)	Penalty applicability at Camp & Project Site	Maximum penalty per unit (Col E) per year for the specified area (in INR)
A	B	C	D	E	F
General	Upkeep of camp area- clearing bushes, etc.	7	1,000	Per 100 person camp/ Site	12,000
	Approach Roads	15	2,000	Per 100 person camp / Site	24,000
Housing/ accommodation	Accommodation space per person	15	200	Per room	2,400
	Fan	7	200	Per room	2,400
	Window	7	200	Per room	2,400
	Ceiling height	15	200	Per room	2,400
	Mattress	7	100	Per unit	1,200
	Signages	15	200	Per 100 person camp	2,400
	Provision of lighting/ socket in room	7	200	Per room	2,400
	Plinth height	15	1,000	Per 100 person camp	12,000
Washrooms	Area and specifications	15	500	Per washroom	6,000
	Nos of WC	15	500	Per washroom	6,000
	Dustbins and disposable bags	7	100	Per washroom	1,200
	Handwash and soap	7	100	Per washroom	1,200
	Daily cleaning as per specification	7	100	Per washroom	1,200
	Ventillation as per specification	7	100	Per washroom	1,200
Bathrooms	Area and specifications	15	500	Per bathroom	6,000
	No of bathrooms	15	500	Per bathroom	6,000
Drinking water	Capacity for drinking and cooking (fresh water tanks)	7	1,000	Per 100 person camp/ Site	12,000
	No of water stations/ coolers (all with RO)	7	1,000	Per 100 person camp/ Site	12,000
Water for washing and cleaning	Capacity (as per specifications)	7	1,000	Per 100 person camp/ Site	12,000
Water treatement	availability of grey water treatment unit	15	1,000	Per 100 person camp/ Site	12,000
	availability of Sewage treatment plant	15	2,000	Per 100 person camp/ Site	24,000
Dining hall	Capacity of dining hall	15	2,000	Per 100 person camp/ Site	24,000
	Seating capacity (tables/ chairs)	7	200	Per unit	2,400
	Air coolers	7	1,000	Per hall	12,000
	Fans	7	1,500	Per hall	18,000
	Insectecutor	7	500	Per hall	6,000
	Drinking water coolers	7	1,000	Per hall	12,000
	Hand wash basin	15	500	Per hall	6,000
	Hand wash/ soap	7	200	Per hall	2,400
	Covered food- waste bins	7	200	Per hall	2,400
Kitchen/ canteen	Area of cooking space	15	2,000	Per 100 person camp	24,000
	Exhaust fan	7	200	Per 100 person camp	2,400

Areas	Provisions/ sub areas (as per specifications in tender norms)	Timeline for compliance post inspection (days)	Penalty for each instance of non-compliance post timeline given at inspection (in INR)	Penalty applicability at Camp & Project Site	Maximum penalty per unit (Col E) per year for the specified area (in INR)
	Fire extinguisher	1	200	Per 100 person camp	2,400
	Storage with lock and key	7	100	Per 100 person camp	1,200
	Utensil washing area with hot water supply	15	500	Per 100 person camp	6,000
Steps for weather conditions	Minimum shaded space per person	15	2,000	Per 100 person	24,000
	Fans	15	200	Per 100 person	2,400
	Hydration supplements	7	50	Per person	600
	Heaters/ Blowers	7	200	Per 100 person	2,400
Transportation	No of buses/ trips	15	500	Per 100 person camp/ Site	6,000
Recreation facilities	Open space as per specification	15	2,000	Per 100 person camp	24,000
	Recreation room	30	500	Per 100 person camp	6,000
	TV	7	500	Per 100 person camp	6,000
	Floor mats/ chairs in TV room	7	200	Per 100 person camp	2,400
Medical facilities	Annual check up	15	100	Per person	1,200
	Ambulance	15	200	Per 100 person camp/ Site	2,400
	First aid (for each location)	7	100	Per 100 person camp/ Site	1,200
Waste disposal	Daily cleaning	7	500	Per 100 person camp/ Site	6,000
Emergency assembly area	Space as per specification	15	500	Per 100 person camp/ Site	6,000
	Notice board	7	200	Per 100 person camp/ Site	2,400
Creche	Provision as per specification	15	2,000	Per 100 person camp	24,000
Electric room	As per specification	15	2,000	Per 100 person camp	24,000
	DG set	7	1,000	Per 100 person camp	12,000

Note: In case of non- adhernace of the compliances mentioned in the contract or otherwise as applicable by the labour law, the principal employer will supply/ provide the facility and recover the cost of the same with penalty from respective contractors' running bill.

The maximum overall penalty per year for non compliance of norms for labour facilities as per the tender document would be capped at 1% of the overall contract value

SOCIAL MEDIA POLICY FOR BUSINESS PARTNER

[ANNEXURE - XX TO SPECIAL CONDITIONS OF CONTRACT]



BHARAT PETROLEUM CORPORATION LIMITED
SOCIAL MEDIA POLICY FOR BUSINESS PARTNERS

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TERMS AND CONDITIONS FOR ACCEPTABLE USE OF SOCIAL MEDIA BY BUSINESS PARTNERS

1. OBJECTIVE

Social media has become part of everyday life and a means of communication and sharing information with others. Every organization recognises the benefits that social media tools can provide, and also reckons the challenges it brings.

These terms and conditions ("**Social Media T&Cs**") seek to provide clear guidance on acceptable standards of conduct and practices to be followed by the Business Partners (*as defined below*) of Bharat Petroleum Corporation Limited ("**Corporation**"), in the usage of social media tools during and post their association with the Corporation. These terms and conditions are intended to protect and safeguard *inter alia* the interests and reputation of the Corporation, in the access, use of or participation on Social Media (*as defined below*) platforms by such constituents.

It is important to maintain the highest degree of professional standard that is associated with the Corporation's name, brand and reputation. Constituents must constantly be aware of the risk of damaging the Corporation's name or reputation in public forums. These terms and conditions should be adhered to by each constituent at all times and should be read harmoniously and in conjunction with the terms of their engagement with the Corporation, as well as other applicable policies and directions issued by Corporation, from time to time, including the Relevant Documents (*as defined below*).

1.1. Social Media

Social Media includes any web or mobile based platform that enables an individual or agency to communicate interactively and enables exchange of user generated content. The term "**Social Media**" describes internet-based technologies and practices that people use to share opinions, insights, experiences and perspectives. It may be internal (housed within the Constituent's technology infrastructure and open for use only by the Constituents) or public (widely available to the population of internet users).

These terms and conditions are applicable equally to a wide range of websites and mobile phone / tablet applications, including the following:

(a) Social Networking sites, for example - Facebook, Twitter, and LinkedIn.
(b) Media Sharing sites, for example - Instagram, Snapchat, YouTube
(c) Discussion forums, for example - Reddit, Quora, Digg, Glassdoor
(d) Content Curation network, for example - Pinterest, Flipboard

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(e) Blogging and Publishing sites, for example - WordPress, Tumblr, Medium including blogs
(f) Interest-based network, for example - Goodreads, Houzz
(g) Information sharing sites, such as Wikipedia
(h) Opinion sites (e.g. Yahoo! Answers)
(i) Any other social media platform/s

1.2. Scope and Applicability

These Social Media T&Cs are applicable to all Business Partners (*as defined below*), including any prospective partners of the Corporation (the "**Constituents**").

The Social Media T&Cs provides a framework for the usage of Social Media by the Constituents and non-conformance with these Social Media T&Cs or any other applicable policy or directions issued by the Corporation as may be relevant to the Constituents, may result in penalties ranging from financial to legal liabilities, as set out under the respective contractual understanding between each Business Partner and the Corporation.

1.3. Relevant Documents

These Social Media T&Cs have been formulated in line with the Framework & Guidelines for Use of Social Media for Government Organizations, issued by the Department of Electronics and Information Technology, Ministry of Communications & Information Technology, Government of India.

In addition, these Social Media T&Cs must be read in conjunction with the underlying contract documents including the following documents (collectively, the "**Relevant Documents**"), as may be applicable to each Constituent:

(a) General Conditions of Contract for vendors (relevant clauses are placed at Annexure I);

(b) Transportation Contract Agreement Bulk LPG Transportation Contract By Road (relevant clauses are placed at Annexure II);

(c) PCVO, Retail and Lubes Transport guidelines.

2. CONTENT GUIDELINES

This section seeks to set out the guidelines for content management as well as administration rights of all official Business Partner Social Media accounts and ensure accountability of the authorised representatives of such Business Partner.

The following guidelines on content sharing ("**Content Guidelines**") must be followed, in relation to all content created, posted or shared on Social Media:

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(a) All post and other content shared via Social Media shall abide by applicable laws, including the Information Technology Act, 2000 and rules made thereunder, as amended.

(b) The content posted or shared though official Social Media accounts, shall be relevant, engaging and in line with the Corporation's brand and communication strategy, whether in the form of text, images, gifs, videos, etc.

(c) The Constituents shall be mindful of content and the tone associated with it. A negative tonality, sarcasm, dry humour, pun, memes, etc. should be avoided to steer clear from any controversy.

(d) The Constituents shall be careful and ensure that any content posted or shared through the official Social Media accounts does not bring disrepute to the Corporation. Opinion or comments on political observations, religious beliefs, gender biases, etc. must be avoided while operating official Social Media accounts. In the use of official Social Media accounts, the Constituents shall refrain from forwarding or sharing any videos or images or messages, which are considered inappropriate or any content that is considered offensive, obscene or derogatory in nature.

(e) The Constituents shall be cognizant of concerns regarding confidentiality and disclosure requirements, and must at all times, adhere to the Relevant Documents as well as these terms and conditions, to understand what shall be disclosed on a public platform. For instance any communication marked as "privileged" or "restricted" or "confidential" or "not for circulation" should not be shared on Social Media. The Constituents are absolutely prohibited from disclosing commercially sensitive, anticompetitive, private or confidential information. If unsure whether the information that is proposed to be shared falls within one of these categories, authorised representatives of the Constituent may discuss with the concerned official as designated by the Corporation.

(f) The Constituents shall ensure that any references to the Corporation or its employees, or other customers, partners and vendors do not contravene any non-disclosure agreements. The Constituents shall avoid disclosure of any information pertaining to any employee / vendor / customer or individual associated with the Corporation, without their prior consent.

(g) The Constituents shall be vigilant about tagging, mentions and conversations around the Corporation. If it notices any customer complaint, dealer/ distributor/ vendor grievances, media story etc., the same may be flagged to the official channels of the Corporation and will be responded to by authorized personnel within the Corporation.

(h) In the operation of official Social Media accounts, the Constituents shall be cognizant of maintaining professional etiquette for all interactions and shall not initiate or engage in discussions which may be characterised as showcasing a personal opinion such as political or religious beliefs. In

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addition, official Social Media accounts should not share any content or comment that may be viewed as colouring the relations between the Corporation and the Government of India or any Ministry / Department of the Central or State Governments.

(i) The Constituents, particularly in the use of official Social Media accounts, shall only post original content, which is free of any copyright infringement or plagiarism. To ensure the reputation and principles of the Corporation are safeguarded, all Constituents must avoid posting content that violates the law, infringes the intellectual property rights of the Corporation and its group companies or of any individual or organization. Any inadvertent posts, which violates these principles, must be removed / deleted immediately upon becoming aware of the implications as set out in these guidelines.

As responsible business partners of the Corporation, the following points must be strictly observed and followed by the Constituents:

(i) Text, photos, images, musical work in any form, video clips, movie clips, or any other content for which the Constituent does not own copyright, must not be used in any form, and in particular for official purposes to promote any activities related to the Corporation, without obtaining consent from the copyright owner. If the copyright owner for such work cannot be identified or if the consent for use of such work is not provided by the copyright owner, the work must not be used by the Constituent.

(ii) Capturing photographs and/or videos of the Corporation's offices, facilities, and other establishments (within or outside) or customer sites is strictly prohibited. Any such illegal images and/or videos of the Corporation's establishments, offices, facilities and factories or other sites and whether directly emailing or otherwise circulating such content via Social Media posts on the Internet, shall attract legal consequences. Official visual materials may be availed from the Corporation and can be requested through email, to the relevant State / Territory team.

(iii) Creation, sharing and/or distribution of videos which make use of unlicensed music is strictly prohibited.

(iv) Unauthorized videos of any events hosted by the Corporation, whether within or outside the Corporation's premises that may be captured by Constituents shall not be shared/distributed on Social Media.

(v) All Constituents must take due care to protect the Corporation's copyright and intellectual property within and outside the organization.

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(j) The authorised personnel operating official Social Media accounts of respective Business Partner shall not post unverified news, or news from dubious 'sources', that may project the Corporation in a negative light.

(k) The admins operating official Social Media accounts shall clearly state the source and give due disclaimers while quoting any third-party content through such Social Media accounts.

(l) Additionally, content on official Business Partner Social Media Accounts shall be limited to the coverage of activities related to the business only. However, these accounts can re-share / retweet the posts of Corporation's official Social Media accounts, subject to the veracity of such accounts.

3. ACCEPTABLE USAGE OF SOCIAL MEDIA BY BUSINESS PARTNERS

The following guidelines are applicable to vendors, suppliers and other contractors of the Corporation ("**Business Partners**"), and these are intended to supplement, and do not to replace the terms and conditions or any other agreement or guidelines (including the applicable provisions set out under Annexure I or II of these Social Media T&Cs), which are currently in place to regulate the conduct of such Business Partners:

(a) Business Partners have the discretion to decide whether their Social Media accounts will be used for personal or professional purposes. However, in any event, whether such Social Media accounts are used for official purposes or personal purposes, to the extent that they declare their affiliation with the Corporation in any way, it is deemed that they will abide by these terms and conditions read with the applicable contractual provisions and the Framework & Guidelines for Use of Social Media for Government Organizations, issued by the Department of Electronics and Information Technology, Ministry of Communications & Information Technology, Government of India.

(b) Only official Business Partners accounts are eligible to declare their association with the Corporation or using any content owned by or belonging to the Corporation, including logo, product specifications, product pictures, product catalogues, etc. Such accounts may only post content that are official in nature and reasonably expected to promote the activities specific to its business. Such official Business Partner Social Media account shall be akin to a professional page to promote business interactions and shall not post any content which may showcase the account as expressing opinion on ancillary matters which are not in furtherance of the objective set out under the Relevant Documents, such as posts related to entertainment industry, or political views etc. However, such affiliation or use of Corporation's content, such as logo, product pictures etc. is only limited to use by official Social Media accounts of such Business Partner, and will not, at any time, be used by any authorised or other personnel of such Business Partner, in the operation of a personal Social Media account.

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(c) Every Business Partner's official or personal (individual) Social Media account is prohibited from posting / circulating any official communication / document or disclosing any business-related or other confidential information, pertaining to the Corporation, in accordance with the Relevant Documents.

(d) Each Business Partner Social Media account, particularly those accounts which have been permitted to acknowledge their association with the Corporation, has an obligation to exercise caution in the posting or sharing of content on Social Media, and shall undertake adequate diligence prior to posting any content. In particular, such accounts shall be fully cognizant of posting or providing traction to any 'fake news' and shall refrain from posting or sharing unlawful, controversial or unverified news, or news from dubious 'sources', particularly in relation to the Corporation and the Central / State Governments.

(e) The Business Partner Social Media account which are maintained for official purposes, shall refrain from engaging in unlawful or inappropriate posts or sharing any content that may be defamatory or may have the effect of downplaying the Corporation's business or competitors. In addition, such account should also not post or share content using derogatory language or is likely to demean sentiments of anyone with whom they engage in any public communication using Social Media.

(f) Business Partners using Social Media for official purposes and especially those accounts that have been approved by the Corporation, shall maintain professional and proper etiquette in online interaction via Social Media and shall not engage in inappropriate behaviour. Such inappropriate behaviour includes but may not be limited to posting, sharing or endorsing in any form, any content which may be considered as:

(i) Divisive, unethical or unlawful at the workplace;

(ii) False, or derogatory, or amounting to bullying, trolling, intimidating, or harassing including using offensive, defamatory, threatening, discriminating, obscene or insulting language;

(iii) A misrepresentation of the Corporation, such as creating any unofficial groups or networks (whether intentional or unintentional) using the Corporation's name, logo, or email address;

(iv) Compromising the confidentiality (of the Constituents and/or the Corporation's information), or creating a conflict of interest;

(v) Disclosing commercially sensitive, anticompetitive, or information which is marked as restricted for internal circulation within the Corporation;

(vi) Misleading and misrepresentative, such as creating or endorsing any video channel / account representing the Corporation or any specific Business Unit, or otherwise posting or sharing any content owned by the

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Corporation, unless such content has been posted on verifiable official Social Media accounts of the Corporation;

(vii) Amounting to pornographic material (that is, writing, pictures, films and video clips of a sexually explicit nature) or content that could be considered as offensive, obscene or criminal; or

(viii) Creating or likely to create any liability (whether criminal or civil, for the Corporation).

Where evidence of misuse or inappropriate behaviour is brought to the notice of the Corporation, the Corporation may undertake a more detailed investigation in accordance with its procedures, which may involve the examination and disclosure of records by those nominated to undertake the investigation and any witnesses involved in the investigation. If necessary, action may be taken against such Business Partner under the respective contractual agreement and in case required, such information may be handed to authorities in connection with the investigation.

(g) Any violation of these Social Media T&Cs shall be treated as violation of General Conditions of Contract of the Corporation and may invite action by the Corporation as deemed fit, based on the sole discretion of the Corporation.

(h) The Corporation has a zero-tolerance policy for any complaints that may be brought to its notice via Business Partner Social Media accounts. In the event the Business Partner or its associates *etc.* are dissatisfied with the Corporation, or have any unresolved query or grievance against the Corporation or any individual who is in the employment or association of the Corporation, the Business Partner or such person associated with it must reach out to the designated official and follow the hierarchy established within the Corporation. All such communication must follow the formal processes that are available as per contractual agreement with the Corporation. In the event the Business Partner, whether by itself or its employee or associate publishes any such information on Social Media or discloses details of any complaint or dispute with the Corporation on a public forum through Social Media, it will be in breach of the terms of these T&Cs and its agreement with the Corporation, and the Corporation will have the right to pursue such legal remedies as may be appropriate and available under law.

(i) Upon termination or expiry of the Relevant Document / underlying contractual agreement between the Corporation and the Business Partner, the Business Partner shall ensure that all references and posts which disclose any affiliation with the Corporation has been scrubbed from the Business Partner's Social Media account and a formal written declaration to this effect must be provided to the Corporation, within 7 days of such termination or expiry.

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4. ENFORCEABILITY AND COMPLIANCE

4.1. These Social Media T&Cs are construed to be a part of the Relevant Documents and form an integral part of the contractual understanding between the Corporation and the Business Partner.

4.2. Any violation of the Social Media T&Cs shall be treated as violation of respective contractual understanding between the Corporation and the Business Partner, and may invite appropriate action by the Corporation as deemed fit.

4.3. The Business Partner agrees and understands that all activities of the Business Partner's official Social Media Account is subject to monitoring and periodic audits by the Corporation, if required.

4.4. The Business Partner will provide its written acknowledgement to these Social Media T&Cs, in the form set out in Annexure III, failing which the Corporation may take such action as may be necessary to ensure compliance with these terms and conditions.

4.5. The concerned official of the Corporation shall be responsible for reviewing the compliance of these Social Media T&Cs as may be required to ensure that it meets legal requirements and reflects best practice.

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ANNEXURE I

GENERAL CONDITIONS OF CONTRACT FOR VENDORS

Clause 34: Contractor's Subordinate Staff and Their Conducts:

34.2 If and whenever any of the Contractor's or sub-contractor's agents, sub-agents, assistants supervisor or other employees shall in the opinion of Engineer-in-Charge be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the owner or Engineer-in-Charge, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the contractor, if so directed by the Engineer-in- Charge, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the works without the written permission of the Engineer-in-Charge. Any person so removed from the works shall be immediately replaced at the expense of the contractor by a qualified and competent substitute. Should the contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.

34.3 The contractor shall be responsible for the proper behaviour of all the staff, supervisor, workmen and others and shall exercise a proper degree of control over them and in particular, and without prejudice to the said generality, the contractor shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighbourhood and in the event of such employee so trespassing, the contractor shall be responsible therefore and relieve the Owner of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the Engineer-in-Charge upon any matter arising under this clause shall be final. Contractor shall ensure that none of their employees are ever engaged in any anti-national activities.

Clause 44: Liens

44.2 Contractor will not disclose details of the work to any person or persons except those engaged in its performance, and only to the extent required for the particular portion of the work being done. Contractor will not give any items concerning details of the work to the press or a news disseminating agency without prior written approval from Engineer-in-Charge. Contractor shall not take any pictures on site without written approval of Engineer-in-Charge.

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ANNEXURE II

TRANSPORTATION CONTRACT AGREEMENT FOR BULK LPG TRANSPORTATION CONTRACT BY ROAD

Clause 28:

(a) The Transporter shall remain at all times liable to the Corporation for any loss or damage caused to any building, plant machinery or the property of the Corporation due to careless, negligent, inexperienced act or default of the Transporter, their agents, representative or employees. The Corporation shall be entitled to deduct from the amounts payable to the Transporter under this Agreement or otherwise the loss or damages so suffered.

(b) The Transporter will be liable for any loss and/or injury to Corporation's employee due to careless, negligent, wrongful act or default of the Transporter, his/their representatives or employees in carrying out the job under this contract.

Clause 38:

All terms & conditions stipulated in the Guidelines for Bidders, Tender Terms & Conditions, Declarations, Agreement, Industry Bulk LPG Transport Discipline Guidelines and other documents furnished with the Tender and related correspondence shall form part of the contract. The Corporations are entitled to frame and implement the Policy(ies) applicable to Transporters, and to modify and amend the same from time to time, and that the Policy(ies) as framed, amended and modified would be binding on the Transporters, immediately upon being communicated to them.

Clauses from Transportation Agreement of Retail and MAK Lubricants

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ANNEUXRE III

FORMAT OF ACKNOWLEDGEMENT

To,
[*insert details to whom such acknowledgement may be addressed***]**

[*in the case of an individual or sole proprietorship*] I am _____ , an inhabitant of _____ and carrying on business of _____

OR

We are [*insert names of all partners of firm*] carrying on business at _____ in partnership under the firm name and style of M/s. _____

OR

[*insert name of Limited Company or a Co-operative Society / Trust Co-operative*] incorporated under the laws of India and having its Registered Office at _____
_____

I / We have entered into a [insert name of agreement] dated [*insert date*] ("**Agreement**") for the [*insert purpose*], with Bharat Petroleum Corporation Limited ("**BPCL**").

In furtherance thereof, we have been provided with a copy of the Terms and Conditions for Acceptable Use of Social Media by Business Partners, issued by the Corporation.

I / We have read and understood BPCL's Terms and Conditions for Acceptable Use of Social Media by Business Partners and agree to abide by it.

I / We understand that any violation of the above conditions may result in disciplinary action, or termination or revocation of the Agreement.

In acknowledgement thereof, please see below our acceptance of the Terms and Conditions for Acceptable Use of Social Media by Business Partners, issued by the Corporation, duly signed and acknowledged by [*insert name*], in the capacity of our authorised representative.

A copy of such authorisation is also attached for your record.

_____
(Signature & seal)

Name:
Designation: Date:

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Advisory on Environmental Criteria

[ANNEXURE - XXI TO SPECIAL CONDITIONS OF CONTRACT]

BPCL Supplier / Vendor Advisory on Environmental Criteria

Dear Suppliers / Vendors,
As you aware that environment is one of the most precious gifts given to us by Mother Nature. We must be conscious of our actions and act responsibly to preserve and conserve the environment. BPCL has always endeavoured to be a responsible & conscious corporate citizen. We would also want to engage you - our suppliers - in the efforts to reduce our impact on the environment.

Below are the advisory guidelines on environmental criteria, which we want our suppliers to follow:

1. **Emission / Pollution Control (Air, Water, Soil, Noise etc.)**
a. The organization and its all operations should follow all laws related to emission / pollution norms.
b. The organization should get all necessary approvals & certifications for emission / pollution control from relevant authorities for plants, equipment, vehicles etc.
c. Monitoring mechanism should be put in place for all emissions / pollution emitted from organization owned assets e.g. Equipment, vehicles etc.
d. Organization should conduct training and awareness programs for the staff on emission / pollution impacts & prevention.

2. **Energy**
a. Monitoring energy consumption by the organization from all sources should be done.
b. Organization should strive to reduce energy consumption by employing energy efficiency & conservation measures.
c. Use of alternate fuel sources & renewable energy should be promoted by the organization.

3. **Water**
a. Water consumption from all the sources should be monitored by the organization.
b. Reduction in water consumption should be aimed by treating waste water & alternative use of waste water.
c. Waste water should be treated to remove harmful elements before releasing it to the eco-system.

4. **Reducing Resource Intensity**
a. Optimization / re-use / recycle techniques should be used to reduce the use of resources.
b. Minimizing use of resources having major environmental impact should be done and substitutes should be found.
c. Proper handling should be done for hazardous resources (chemicals etc.) having impact on humans & eco system.

5. **Waste Management**
a. Waste segregation based on type of waste (solid, liquid, hazardous, etc.) generated by the organization should be done.
b. Opportunities for recycling & re-use of waste should be identified & promoted by the organization.
c. Hazardous waste should be handled by trained personnel & disposed to authorized agencies only.

6. **Risk Mitigation**
a. Environmental Risk Assessment should be carried out for all the organization's operations.
b. The severity / extent of damage due to the environmental risk should be estimated.
c. Staff / personnel involved in operations related to environmental risk should be trained and regular awareness programs should be conducted.

The guidelines are indicative of the direction that the suppliers should take to be more environmentally supportive. Suppliers should join hands with BPCL in making a value chain that is environmentally aware and responsible.

Procedure for Vendor Invoice Processing

[ANNEXURE - XXII TO SPECIAL CONDITIONS OF CONTRACT]

Business Process Excellence Centre

To Our Esteemed Suppliers/ Contractors,

BPCL has setup a Business Process Excellence Centre (BPEC) for Vendor Invoice processing.

BPEC will function as a payments factory to receive, digitize and process vendor invoices in a timely and accurate manner. In addition, the centre will receive and account for Bank Guarantees (BGs) & other allied activities like release of retention money/ security deposit etc.

➢ Bill Payments

Effective 1st May 2017, the following original documents will need to be sent to BPEC for release of payments:

i) Original Commercial / Tax invoice
ii) Any Supporting documents for payments e.g. Octroi certificate, freight bills, IRN, test certificate
iii) Copy of the Works Contract Tax (WCT) Exemption Certificate for lower/Nil deduction of WCT (Original must be submitted to Kochi Refinery procurement team for their records)

Please send these documents to the following address for payment processing*:

BUSINESS PROCESS EXCELLENCE CENTRE (BPEC)
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NAVI MUMBAI-410210

**Please note that this does not change the BPCL address that needs to be put on the invoice.*

The following documents should not be sent to BPEC:

- Excise invoice (Duplicate invoice For Transporter- DFT)
- User reference manuals
- Test booklets
- BG against Earnest Money Deposit (EMD) etc.

**These documents should be sent to the procurement location i.e Kochi Refinery*

How to Track Status of Bills sent to Business Process Excellence Centre (BPEC)?

1) For every valid bill received at BPEC, the vendor will be communicated with a unique DPID no. on their registered email ID & mobile no. as per BPCL records
2) Vendors can contact Toll Free No. 1800 224 221 during working days between 9.00 AM to 5.00 PM for any payment/ bill related queries
3) Vendors can write to z_vendorhelpdesk@bharatpetroleum.in for any queries
4) The payment status of your invoices can also be check in Vendor Portal (*https://efp.bpcl.in/*)
5) The payment status of your invoices can also be check in Mobile Application (https://ebiz.bpc.co.in/EbizPortal/)
6) For status of specific invoices, vendor can also use SMS application by sending SMS **"STAT (Space) <DPID>"** to 9223112222 from their registered mobile no.

General Guidelines for Invoices

All invoices should be legible and accompanied with supporting documents required for invoice processing as per the PO. Invoices should be compliant with government requirements on tax invoices and should have the following information:

- PO number, clearly mentioned (45XXXXXXXX)
- Vendor code (Available with your BPCL contract)
- Vendor name
- Vendor address, telephone number, email address and point of contact
- Tax registration number (VAT, Service Tax, Excise etc. as applicable)
- The invoice should be in name of Bharat Petroleum Corporation Limited (BPCL)
- Invoice number
- Invoice date
- Specification of goods and services delivered
- Total gross amount and breakup
- Taxes applicable, with individual tax rates matching with the purchase order
- BPCL Location name and address
- Kindly ensure multiple invoices are not bunched together (stapled) whilst sending the same to BPEC for processing.

**Please note that the above information should be present on the invoice, to ensure that the invoice is processed in a timely manner*.

➢ Release of Security Deposit/ Retention Money

Standard Template for Release of Retention Money & Security Deposit is duly attached herewith which should be used by all vendors/contractors while submitting their release of Retention/Security deposit requests to BPEC.

With respect to the said template vendors are required to note the following point:

1) Only single Purchase Order (45XXXXXXXX) / Contract (46XXXXXXXX) can be provided per request letter (separate requests letters for each Purchase Order/ Contract)
2) **Photo copies of old invoices/bills** to which the retention money pertains **should not be attached** with the request letter
3) Request letter must be duly signed by the vendor or their authorized representative
4) There is no requirement for BPCL officers to sign on the said request letter
5) Request letter must be sent to BPEC only after completion of job (for security deposit) or completion of defect liability period (for retention money)
6) Vendors can also send scan copy of the said letter duly signed to z_vendorhelpdesk@bharatpetroleum.in
7) Vendors will also be receiving emails for tracking of these requests on their registered email ID's

➢ Guidelines for Bank Guarantees and Performance Bank Guarantees

All PBGs and BGs should be accompanied with a cover letter stating one of the following (available with your BPCL contract)

- PO/ Contract number
- RFQ number

In addition, please clearly state the following:

- Vendor number
- Vendor Name, address, email address and phone number
- Vendor point of contact
- BPCL location and address

Further, currently on receipt of these BG's, letters are being sent to issuing Bank for BG Confirmation. On many occasions there are delays or no response from Banks with regards to confirmation of BG's which ultimately leads to delay in release of vendor payments.

Considering the above pain points, BPCL has tied up with SBI for implementation of SFMS (Structured Financial Messaging Service) Bank Guarantee Process and the salient features are as given below:

1) Vendors/ Contractors shall provide BPCL's Bank Account No. & IFSC Code (Details given below) to their existing Bank at the time of application for Bank Guarantee in favor of BPCL
2) Your Bank shall issue the Bank Guarantee & send SFMS message to BPCL Bank confirming the Bank Guarantee as genuine
3) **BPCL's Bank (SBI) shall in turn send the said SFMS message to BPCL's dedicated email ID basis which BPEC shall consider the said Bank Guarantee as verified by Bank**
4) Once the above process is completed, BPEC Team shall proceed with the release of payment to vendors which is due against the said Bank Guarantee.

Name of Bank: State Bank of India
Branch: CAG Branch, Mumbai
Account No: 11083980831
IFSC Code: SBIN0009995

REQUEST FOR RELEASE OF SECURITY DEPOSIT

Date: DD/MM/YYYY

To,

The Allied Process Team
BUSINESS PROCESS EXCELLENCE CENTRE
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NEW MUMBAI-410210

Dear Sir,

Sub: - **Request for Release of Security Deposit**

Request you to kindly release the Security Deposit money held by Bharat Petroleum Corp Ltd as per the details given below:

Purchase Order	**(45XXXXXXXX)**
Contract No (if applicable)	**(46XXXXXXXX)**
Vendor Code	
Vendor Name	
Description of Services / Job Carried	
Security Deposit Amount	

(Only one PO/Contract # per Request letter will be accepted)

Thanking you,

Yours faithfully
For M/s…….

_____

REQUEST FOR RELEASE OF RETENTION MONEY

Date: DD/MM/YYYY

To,

The Allied Process Team
BUSINESS PROCESS EXCELLENCE CENTRE
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NEW MUMBAI-410210

Dear Sir,

Sub: - **Request for Release of Retention Money**

Request you to kindly release the retention money held by Bharat Petroleum Corp Ltd as per details given below

The request to release is based on (Please tick whichever applicable)

- ☐ Retention money is due since defect liability period is complete
- ☐ Performance Bank Guarantee submitted against PO/Contract

Purchase Order	**(45XXXXXXXX)**
Contract No (if applicable)	**(46XXXXXXXX)**
Vendor Code	
Vendor Name	
Description of Services / Job Carried	

(Only one PO/Contract # per Request letter will be accepted)

S. No	Invoice Ref. No.	Invoice Date	Invoice Amount	Performance Bank Guarantee No. (if retention release against submission of PBG)	Retention Amount
1					
2					

Thanking you,

Yours faithfully
For M/s……

ANNEXURE – XXIII
TO
SPECIAL CONDITIONS OF CONTRACT
PROFORMA OF ABG

[PROFORMA OF ADVANCE BANK GUARANTEE]

PROFORMA OF BANK GUARANTEE - FOR ADVANCE
(On non-judicial paper of appropriate value)

To,

Bharat Petroleum Corporation Limited,
BPCL Office Complex
Business Process Excellence Centre (BPEC)
Plot No. – 6, Sector – 2, Behind CIDCO Garden
Kharghar, Navi Mumbai – 410 210

Dear Sir,

In consideration of the Bharat Petroleum Corporation Limited (hereinafter called 'the Company' which expression shall include its successors and assigns) having awarded to M/s. (Name)…..……. (Constitution)…….. (Address)…..……. (hereinafter referred to as "The Vendor" which expression shall wherever the subject or context so permits include its successors, administrators, representatives and assigns) the contract in terms inter alia for …….. (description of supply), on terms and conditions set out, inter alia, in the Company's Contract No…….dated……. as well as the General and Special Conditions of Contract of the Company and valued at <Currency> (in figures)…….. <Currency> (in words)…… only) and the Company having agreed to make an advance payment of ……% (….. percent) of the said value of the Contract to the Contractor against Bank Guarantee to be furnished by the Contractor in terms of clause …….. of the Contract , the said advance to be adjusted against the price of materials supplied in the manner provided for in clause ……. of the Contract .

We, (Name)…….. (Constitution) ……(hereinafter called "the Bank" which expression shall include its successors and assigns) hereby jointly and severally undertake and guarantee to pay to the Company in ……(Currency) forthwith on demand in writing and without protest or demur of any and all moneys any wise payable by the Vendor to the Company to the extent of <Currency> (in figures)…… <Currency> (in words)…….. only) till the said advance is adjusted as aforesaid at any time up to ……

The amount stated by the Company in any demand, claim or notice, as liable to be paid to the Company by the Contractor, with reference to the above mentioned advance payment under the said Contract , shall, as between the Bank and the Company, for the purpose of these presents, be conclusive of the amount payable by the Bank to the Company hereunder, notwithstanding any dispute or disputes has been raised by the Contractor and are pending before any arbitration, Tribunal or Court.

The Bank agrees that the guarantee herein contained shall continue to be enforceable till the sum due to the Company on account of the said advance is adjusted as aforesaid or till the expiry of this guarantee, whichever is earlier.

The Bank further undertakes not to revoke this guarantee during its currency without the previous consent of the Company.

The Bank also agrees that the Company shall be entitled to enforce this guarantee, notwithstanding any other security or guarantee that it may have in relation to the supplier's liability for the said advance.

Notwithstanding anything said above, our liability under this guarantee is restricted to <Currency> …..... (<Currency> …… only). Our guarantee shall remain in force until …… Unless a claim or demand in writing is made against us under this guarantee before the expiry of …… months from the aforesaid date, i.e. before _____ be relieved and discharged from all liabilities thereunder.

This Guarantee shall be treated as an unconditional guarantee and the Contractor shall have no right to object or obstruct in any way the enforcement of this Guarantee.

This guarantee shall be governed and construed in accordance with Indian laws and subject to the exclusive jurisdiction of courts in India.

Dated this …… day of ……..

Yours faithfully,

(Signature)
NAME & DESIGNATION
NAME OF THE BANK
NOTES:

ANNEXURE – XXIV
TO
SPECIAL CONDITIONS OF CONTRACT

[SPECIAL INSTRUCTIONS TO CONTRACTORS]

SPECIAL INSTRUCTIONS TO BIDDERS/ CONTRACTORS

Apart from scope mentioned in tender, follow are additional instructions to bidder:

"The following requirements are within the Contractor's scope without any additional cost implication. No separate payment shall be made for these items, and the cost shall be considered included in the prices quoted in the Schedule of Rates (SOR) attached with the Tender."

GENERAL:

This tender i.e. composite tender no. B957-999-69-41-PK-T-**9501** shall comprise Mechanical (Piping & Equipment erection), Electrical, Instrumentation, Insulation, Painting, Fire-proofing and miscellaneous Civil/ Structural works relating to offsites and utilities area . Offsites and Utilities plot area is divided in to Part A and Part B per agreed execution philosophy with BPCL.

1. Bidders will ***visit site to assess the site conditions*** and familiarize themselves of ***site specific requirements***. During the visit bidder will also familiarize themselves of ***locally available resources*** that may be required for carrying out site works.

2. Bidder will set up ***well equipped, gated, covered and secured pre-fabrication facilities*** and site offices near the vicinity of site works. Watch and ward of these facilities will **be** bidder**'**s responsibility during the entire duration of the works under the scope of this package

3. ***Approx. 5 acres area for each package will be allocated to the*** contractor for setting up of the prefabrication yard and site office. The location of the fabrication yard is within the BPCL Refinery boundary wall . Fabrication yard will be handover to Contractor in "as it is" condition. Contractor to visit site to assess the location before submitting the bid. Further any grading and other ground preparation as well as shed erection for monsoon preparation as required per SOW to be done by Contractor." Contractor's fabrication yard shall be maintained in good condition. Materials shall be stored off ground, protected from waterlogging and environmental damage, with proper care of handed over material. The area required to be developed by the Contractor by their own and regular housekeeping to be maintained. In case contractor fails to do so the necessary housekeeping will be arranged by deploying other agencies at risk and cost of the contractor as well as vacating the area. Non-availability of space inside refinery from BPCL should not be a case for extra claim or time extension. Therefore, the CONTRACTOR shall, within the quoted price, make alternate arrangement to cope with such eventuality.

MONSOON COMBAT /EXTREME WEATHER CONDITION

4. During the Monsoon season, the bidders shall be ***responsible for making their own arrangements to combat monsoon*** to ensure uninterrupted site works. Bidder will make all necessary ***arrangements for keeping the prefabrication yard, working area free of water logging*** and make necessary approach to work site as required.

5. The execution of the work shall entail working in all seasons including extreme winter/summer and monsoon. In so far as necessary, the bidder shall maintain at job site at all times such material, labor, pumps, equipment and machinery as may be required for the performance of the work during all weather condition including monsoon or other rains and shall plan well in advance for the collection of material and equipment and the erection of such tarpaulins, sheds, wind breakers and/or other protection as shall or may be necessary for the work during all weather condition including monsoon or other rains so that the rains or monsoon ***shall not***

hamper working. Bidder shall also arrange and bring to job site such special equipment and machinery as may be necessary to enable work during the monsoon, and shall, at his own cost and initiative, arrange at all times for dewatering the job sites so as to keep the construction site and areas to be worked upon, free of water. Bidder shall ensure cool air circulation, humidity control for any work or equipment works.

6. Bidder shall familiarize itself with the weather conditions of Bina site across the year. As a precautionary, Bidder to note that ***at least 2 monsoon stretches*** of rainfall are envisaged in the construction duration allocated for the works. ***Detailed plan*** for monsoon combat for ***uninterrupted construction activities during the monsoon period is to be provided.*** Bidder shall Consider atleast 2 peak summer season- cool drinking water supply, sheds with proper ventilation, distribution of ORS for workers and overall sanitation facilities. Bidder to consider mobilization of additional resources suitably considering site weather conditions. No extra time/cost implications shall be entertained in this regard.

7. Bidders shall provide scheme for suitable ***coverage of the work area*** in addition to other covered pre-fabrication yards proposed by them for continuity of works during extreme summer, winter and monsoon and shall implement the schemes for effective mitigation of effects of monsoons including but not limited to preparation of approach roads for vehicular/crane movements, adequate dewatering systems/facilities at no extra cost to the Owner. Monsoon Mitigation Plan for Storage & Execution for insulation works (cover-shed) shall also be provided.

PRE-FABRICATION & TESTING OF MATERIALS

8. Bidder shall have to note the following information to identify the type of prefabrication, sequence of erection
   a. Site facilities viz. overhead bridges, Movement constraints and restrictions, turning radius, existing Fire water lines etc. in view of modular construction and its transportation.
   b. Approach roads/routes.
   c. Area for crane placement
   d. Space for storage and site work

9. ***Adequate covered fabrication, blasting(automatic blasting facilities), painting and storage facilities(hazardous waste disposal of painting materials)***shall be developed by the contractor in allotted fabrication yard for facilitating uninterrupted piping fabrication works. For this purpose, as a minimum, covered sheds as defined elsewhere in the bid, shall be developed by the contractor as mentioned in this document.

10. ***Testing of material (e.g. consumables)*** procured by bidder may be required in authorized laboratories(NABL accredited lab) during the course of execution of works and this will be bidder's responsibility without any time and cost implication to the owner.

11. Bidder shall ensure Comprehensive Piping Spools management for AG system / program during the entire execution of site work. Bidder shall use system/program for material and inventory management, weld mapping, revision management, activity level stage wise control with documentation at all level of fabrication and erection and related commercial billing. Advance technique like RFID for spooling & Bar code system must be used for identification of materials to ensure automation as per specification and access to the systems shall be available to BPCL / EIL on real time basis. Necessary MIS/reports related to above shall be periodically uploaded in Digital platforms of owner (DigiBPREP platform).

12. The bidder shall ensure deployment of their personnel at Spool's manufacturer(s) works as per tender's conditions to have better coordination with them to facilitate receipt of right Spools in accordance with site readiness.

STATUTORY APPROVALS

13. Bidder will ensure ***all local approvals*** for smooth and uninterrupted execution of site work. Bidder shall also ensure proper coordination, liasoning, complying and obtaining approvals as required from statutory/government bodies like GBI/IBR, factory inspector (DISH), labour law compliance authorities, CEA etc and any other required to complete works as per scope in all manner. Bidder has to work in the existing facility area. Contractor to comply with all the safety rules and regulations as per the guideline of BPCL.

SITE COORDINATION & MANAGEMENT

14. The QA plans for execution shall be developed by the Contractor and submitted for Owner/PMC's approval well before start of the work.

15. ***Multiple agencies*** are expected to work concurrently at site; bidder will ensure ***necessary coordination*** with these agencies and ensure smooth construction/ site activities. Interface management plan shall be submitted to the owner / EIL. It is the responsibility of the bidder to plan execution in coordination with the other agencies working on the plot. No time/cost implication shall be applicable in this regard.

16. ***Competent sub-agencies may be engaged by the bidder*** with prior approval of owner for carrying out site works. Augmentation of manpower as required will be bidder's responsibility.

17. Bidder to note that ***construction management*** of the Package shall be done directly by him and shall not be subcontracted to any other agency.

18. ***Skilled manpower required for carrying out site activities*** will be identified by the bidder and month-wise Resource ***deployment plan (Manpower/ Equipment/ Machineries/ Tools etc.) will be submitted*** to the owner post award. Bidder will ensure that the skilled manpower meets all qualification criteria required for performing site works. Bidders shall furnish the trade validation check lists, internal procedure & on-site trade validation plan to owner / EIL for review. All required qualifications tests etc. will be at bidders cost. Overall Execution plan, crane mobilization plan, manpower deployment plan and zonewise construction management plan shall be submitted at bidding stage and detailed plan during execution stage. Further

    a. Bidder to familiarize himself with BPCL material movement and manpower entry/exit procedures including online software platforms. Bidder is requested to consider approximate time taken to prepare gate passes for manpower is 5 days from the date of submission of all required documents. (Safety training, Medical checkup, ESIC/PF etc). Bidder to mobilize resources considering above suitably.
    b. Qualified maintenance team shall also be deployed during Pre-commissioning/Commissioning for any maintenance activity on rotating equipment, if required.
    c. Contractor shall execute mechanical works on a 24×7 basis. Resource planning and deployment shall be managed by contractor to meet this requirement.
    d. Contractor shall prepare and submit a zone-wise weekly execution schedule covering all activities for review and approval.

e. Build Clean concept to be implemented for all equipment.
f. Paramedic staff to be maintained by Contractor for welfare of manpower deployed.

19. ***Latest construction techniques*** will be ***utilized in performing site activities*** with an ***overall objective to maximize production in minimum time*** without compromising on quality. This shall be bidder's exclusive responsibility without any time and cost implication to the owner.

PROGRESS REVIEWS

20. ***Weekly / monthly review meeting*** will be held with successful bidders and in case any ***Contractor lag behind in progress of work,*** Owner reserves the right to engage other agencies to augment site manpower for ensuring smooth and uninterrupted site work at bidders risk and cost. Bidder will ***ensure strong and competent planning and scheduling personnel*** as part of his site management team. All progress review meetings shall be conducted in coordination with DigiBPREP platform. Bidder to ensure timely submission of data/inputs on the platform as per the procedure.

ERECTION OF HEAVY LIFT / TALL EQUIPMENTS/ PIPING/MISC. STRUCTURE

21. Mobilization of required capacity Crane for handling / installation of skid, Structural steel, module, etc. including supply of Operator, Rigging Gang, skilled manpower, tools and tackles and thus make the cranes ready for use is in the Bidder's scope. Erection shall be performed by the bidder in coordination with the Owner/EIL. ***Bidder to provide mast climbers & tower cranes in strategic locations & has to mark it on plot plan for owner's review & approval. All progress review meetings shall be conducted in coordination with DigiBPREP platform. Bidder to ensure timely submission of data/inputs on the platform as per the procedure.***

22. The prime responsibility with respect to erection scheme & arrangements and complete erection lies with the bidder who would have substantial presence at site and shall be in a position to manage all aspects of the erection. For critical lifts above 50 MT, contractor shall prepare lift animations with binder and provide detailed briefings to BPCL/EIL and workmen.

    All equipments (Columns/Vessels/Dryers/Reactors etc) shall be erected in fully dressed up condition to minimize/avoid working at height. Bidder to consider this time taken to dress up the equipment in their erection methodology and plan accordingly.

23. Bidder shall be responsible for preparation of Erection Scheme for modules incorporating the site, schedule and situation specific requirements & shall furnish the same to Owner/Consultant along with offer and same shall be subject to review/approval by owner/ Consultant.

24. Bidder shall be responsible for ***sequencing the erection*** activities with respect to modular structures/ skid/piping and other works, cordoning-off the areas under risk prior to erection.

25. Bidder shall also be responsible for Making the foundation/Structure for erection including chipping/ hacking concrete surfaces of foundation, arranging shims, packing plates, etc., arranging all tools & tackles for aligning the equipment including Auto levels, Theodolites, laser plumbs, hydraulic jacks, stools etc., arranging manual/ power wrenches, torque tensioners etc. as required.

26. Bidder shall be responsible for arranging and erecting scaffolding, ladders, walkways, planks/boards for working platforms, safety nets, hand railing etc. as required for ensuring smooth and safe equipment erection operation. Hanging scaffolding with A/G and U/G

segregator shall be provided at the pipe racks(Full deck) wherever work in UG/Grade are in progress and also above grade activities are in progress.A special design for scaffolding required above 9 Mtr. Jallies not permitted .Contractor to use steel boards.

Prior to commencement of work, successful bidder has to submit the proposed agencies list for owner/consultant review & approval. Approved scaffolding agency should have adequate experience and approval for the same should be by engineering –in-charge prior to engagement. Bidder to ensure availability of one scaffolding supervisor in every 3 gangs & one scaffolding inspector in every 6 gangs, scaffolding supervisors & inspectors must have certification from approved training institutes & submitted to owner/consultant for validation. Suitable Financial Penalty per day shall be imposed in case of non availability/deployment of scaffolding inspectors and use of non certified scaffoldings.

a. Bidder shall provide lifting beams, spreader beams for equipment erection within the coated rates.

b. Test loads for load testing of cranes shall be arranged by the bidder.

c. Vendor supervision if extended for the reason solely attributed to bidder then the charges towards such overstay shall be recovered from the bidder.

d. Bidder shall also be responsible for removal and reinstallation of all temporary scaffolding, ladders, walkways, planks/boards for working platforms, safety nets, hand railing, Hanging scaffolding etc. installed for facilitating any erection.

27. Bidder shall be responsible for, installing circular platforms, ladders, landing etc., installation of sliding plates/base plates etc. both in horizontal & vertical condition.

28. Bidder shall be responsible for following activities during erection:

- Providing skilled & un-skilled manpower.
- Bolting/tightening and securing the equipment / skid during and upon placement on the foundation including inserting extra shims/pack-plates/jacks etc. if required.
- Bringing the structure/Tack structure to correct alignment with respect to all three axes including blue-matching if required.
- Grouting the equipment base with foundation.
- Preparation of relevant reports and obtaining endorsements as required by Owner/Consultant.
- Bidder to note that specialized agencies with suitable PTR be deployed for bolt tensioning, rotomol cleaning, hydrijetting, chemical cleaning, alkali boil out.

29. Initial Constructability study shall be conducted by the successful bidders within 30 days of awarding the contract & should cover the following minimum mentioned topics:

- Traffic Management.
- Identification of erection holds.
- Identification of dismantling of structure for erection.
- Identification of critical lifts (equipment's, pipingand packages including tandem lifts, skidding).
- Temporary facilities plan (Lay down, office layout, ware house, labor accommodation & transportation).
- Heavy crane movement plan incl preparation of roads, approach or hardstands
- Subcontracting plan.
- Subcontracting plan.
- Construction power & construction water.

- Storage & preservation.
- Statutory approval.
- Waste management plan.
- Dress-up plans.
- Item description should cover protection of U/G facilities, making good the damages as per approved repair procedure, design calculation for stools, arrangement of adequate no. of wooden sleepers, steel mats.
- Bidder to study/assess the equipment layout and indicate resource mobilization according to the requirements to carry out work as per various elevations across the plot.

Final Constructability study shall be presented, within 3 months of award of contract.

30. Piping down comers along with support shall have to be fabricated and keep ready within prior to availability of equipments coming for this work.

31. Tray/ duct coming on already erected structure be procured immediately & made available at site within three month of award of job.

32. Bidder to note all fabrication of piping spool and support shall be done outside the premises of the plant to minimize site erections work such that the modular / bolted erections can be achieved. Except local welding where ever required. Proper traceability during Spooling and fabrication of piping to be maintained by RFID/BAR Code.

Extent of Pipe spooling shall be finalized considering following guide line

a) Rack Piping: Straight Pipe Pieces to be pre-assembled to length of about 25 M and then stringing shall be done at Site along the Rack;
b) All Expansion Loops to be Spooled, keeping in view erection feasibility of the expansion loops.
c) Pipe spooling shall be ensured to the extent of 70% (of Total Weld) in case of Piping in Restricted Place/Tech Structure.

33. Movable/Biodegraded toilets adequate number (01 number of toilet for 25 Nos. workers) shall have to be installed at site. All the toilets have to be periodically maintained and shall be mobilized on site as per man power plan.

34. Bidder has to mobilize adequate no of supervisors/Engineers. Penalty shall be imposed for non-mobilization of the supervisors/Engineer and other personnel as per document no. 7-82-0003 rev 2.

35. Bidder to provide CV of head of each function with an alternate CV.All key personnel (Construction manager, HSE Manager, Quality Manager, Project control manager, heavy lift superintendent, rotary equipment superintendent& material controller) nominees along with one alternate resume to be provided immediately on and when asked or during KOM. Owner's consultant shall interview the key personnel during & accepted personnel shall be deployed. Detailed organization chart should be submitted by the bidder in his technical bid.

36. L2 schedule shall be provided with the bid. L3 Schedule to be provided post award within a month. KoM to be conducted within two weeks of award of LOA/PO.

37. Contractor to have suitable procedure for waste insulation material disposal as per Central/State Pollution Control board Norms. Bidder to dispose of debris generated out of execution as per norms of local municipality/panchayat outside premises at his own cost.

38. Contractor to have suitable procedure for waste insulation material disposal as per Central/State Pollution Control board Norms.

39. Bidder to note that adequate covered area is to be prepared. Minimum covered area required is as follows.

- Painting covered area offsite 10 MTR x 20 MTR within a month of mobilization – 04 nos minimum.
- For piping work covered and other works of size 100 MTR X24 MTR within 3 months award of jobs- 04 nos. minimum.
- Gantry crane yard with capacity of 20 MT with a span of 15 MTR.for open yard.

40. Bidder to note that color coding & material traceability for spools to be finalized with consultation with RCM at site. Bidder to share the schema which shall be followed along with the BID

41. Bidder to note that bar and color coding for piping material to be followed.

42. Bidder to establish Warehouse in complex for storage of material after receipt from warehouse.

43. Bidder to arrange necessary arrangement for automatic blasting.

44. For sprinkler system ,caps/plugs to be supplied for testing purpose.

45. Minimum two subcontractors to be mobilized for Insulation, Painting for each to safeguard against risk of relying on just one party..

46. Bidder to note that Mechanical completion definition has been specified in the contract. Also Bidder to note that SOR items for Mechanical completion and pre commissioning/commissioning has been specified in scope of work. Separate SOR items have been identified for Pre-comm. & Commissioning activities

47. Bidder to arrange Boroscope for inspection for Stretch of inlet piping of critical equipments. Especially Exchangers, Compressor, Compressor suction piping/critical piping and other High Energy Intensive Rotating Equipment).

48. Bidder to arrange Automatic & semi automatic machines for Cutting/Beveling& welding.

49. As Mobile Phones are restricted inside the Premises Contractor to have provision for Tata Walkies or similar communication systems.

50. Bidder to arrange Double Decker Site offices(due to space constraints).

51. Bidder to arrange adequate diesel dewatering pumps for hydro-test Draining and Monsoon Mitigation.

52. Bidder to arrange Rotomole cleaning/Hydro jetting for critical pipe flushing.

53. Specialized agency for Torquing & Tensioning and Catalyst loading shall be mobilized. Formatted Record shall be generated against box-up of each Flanged Joint included in the Composite Contract

54. Bidder to arrange AUT(Automated Ultrasonic testing) for pipe welding inspection.

55. CPM / PERT – Bidder to submit a detailed schedule in network form, identifying critical path.

56. Lists of Instrumentation agencies to be submitted to EIL for approval. Agency to have Testing Facility-PSV, Control Valve etc.

57. All piping spools are to be fabricated at established mechanized shop.

    Mechanized Spooling Work up to 32"NB: Contractor shall carry out Mechanized Spooling Work for pipe size up to 32"NB at its, or its Sub-Contractor's, Workshop.

    Semi-Mechanized Spooling Work above 32"NB: Contractor shall carry out Semi-Mechanized Spooling Work for pipe size above 32"NB at its Fabrication Shop/Yard put up at Site.

    Piping spools shall be erected at Site only after all reports are reviewed and verified as mentioned in contract. All piping spools are to be erected after checking internal cleaning. Build Clean concept to be implemented for all equipment/piping/spools.

58. Pipe Spooling in Mechanized Set-Up:

    This category of Pipe Spooling shall mean manufacturing of pipe spools in controlled environment, by employing mechanized spool-fabrication assembly line(s) (automated tools & machines for forming, cutting, squaring, edge-preparing, welding, etc.) and synchronized material handling facilities, in order to deliver fabricated pipe spools with highest productivity and with least quality concerns.

59. Bidder to ensure that at any point of work execution if individual SOR quantity is exceeding ,the same is to be intimated to EIL&BPCL within 10 days of receipt of drawings and prior Approval is obtained before undertaking any such work. Moreover, excess- saving statement to be prepared every quarterly after six months of award of job. Payment will be made by the OWNER against Running Account (RA) Bills certified by the EIC/Site-in-Charge within 30 days from the date of receipt of complete and correct R.A. Bill with supporting documents from the Contractor by Engineer-in-Charge.

60. Flare header & other lines requiring pneumatic testing of size 24" NB & above, flushing shall be carried out prior to pneumatic testing and clearance shall be taken from operation group and then contractor shall proceed for pneumatic testing and box up. After pneumatic testing and box up, it shall be preserved so that no further cleaning is required at a later date.

61. Pre commissioning & commissioning activity shall be commenced even prior to the Mechanical clearance of entire unit. However the total time period for pre-commissioning and commissioning shall be maximum within 3 month from unit Mechanical completion date. All activities related to this must get completed within time period.

62. During Pre -commissioning/Commissioning number of activities like fabrication, erection, testing, tubing, loop checking, valve dismantling, re-election, structural modification, equipment dismantling/re-erection etc. which were not part of mechanical clearance and reasons are nor attributable to contractor may have to be carried out but the rates for the same is available, The same shall be utilized for carrying out the activity during Pre-commissioning/Commissioning.

63. After respective mechanical completion & Pre commissioning/commissioning contractor has to demobilize the resources, temporary structure etc.and clear the work site within 15 days. In case the same is not demobilized in specified time frame, same shall be done and shall be back charged to the contractor.

64. Bidder to provide facilities for critical valve testing. Contractor shall provide small facility for valve testing and repair.

65. Bidder to Use pre insulated tubes as mentioned in scope of work.

66. Bidder to construct sufficient no of underground pits for storing radiography source/camera systems as per guidelines issued by BARC in his allocated area.

67. **Penalty:**

The Contractor shall adhere consistently to all provisions of HSE requirements as per specification no. **6-82-0001 Rev.2**. In case of non compliances and also for repeated failure in implementation of any of the HSE provisions,
EIL/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty as per above specification.

68. Contractor to identify /study the system to be cleaned for rotomol/manual cleaning or hydro jetting and advise on any extra opening or drains of appropriate size after study in consultation with EIC and their sub agencies within three month of award of job.

69. Residual Insulation, Painting, Scaffolding Removal, etc., which are usually kept/allowed in Pre-Commissioning Period, should all be completed prior to declaring Mechanical Completion.

70. Bidder shall work on priority areas identified by EIL / Owner on regular basis.

71. Facilities to be setup by Contractor
    a) Warehouse within Refinery. Bidder to establish warehouse in complex for storage of materials after receipt from EIL/BPCL warehouse.
    b) Warehouse to have physically segregated Zones corresponding to Units zones, especially for piping items
    c) Material receipt and material issue vouchers to have specific zone mentioned
    d) Contractor shall provide and operate a small mechanical workshop with minimum one lathe, one drilling machine and necessary lapping arrangement for seal faces, PSV discs and nozzles throughout contract duration.

    Prefabrication & Testing of material
    a) Piping spool management software - Contractor shall provide one license each to EIL & BPCL of the software / program.

72. Site coordination and management

    Piping - Bidder / Contractor to provide piping area wise following with schedule
    - Work quantum of piping (ID)
    - Associated NDT
    - Material requirement / availability
    - Free issue items
    - Drawing issuance plan
    - Work front release plan.

    Contractor to prepare area wise work packages including following on a daily basis (DPR):
    - Resources deployment plan – Supervisors, skilled man-power like welder, fitter, grinder, rigger etc.

- Work front availability matrix (Drawings Vis-a Vis material)
- Area wise responsible Safety supervisor / Job Safety Analysis

Contractor to provide equipment wise work load (specially welding ID, structural erection MT) and construction plan.
Contractor to provide resource deployment plan for erection and associated works after award of work..

Contractor to provide warehouse management data dumps to EIL / BPCL on receipt &utilization of materials on weekly basis, to enable control/ tracking of material post issuance to contractor up to erection/ installation.

Contractor / Bidder to provide quality assurance plan with assessed quantum.

73. All contractor supplied material shall be inspected by BPCL approved TPI.

74. No LET - OUT of cranes under the scope of a particular contract is allowed at site. However, in the interest of job, if let- out from one agency to other agency is need of the time, it shall be only after due permission from BPCL and EIL. However, commercial benefits in this regard be passed on to BPCL by contractor/ agency.

75. PPE quality should be of good quality.

76. Successful Bidder to furnish detailed manpower mobilization (direct and indirect) and detailed equipments and machinery deployment (month wise) after award of job.

77. Machinery, welding machines, Crane, EOT, etc which are required shall be fit to use and shall be assessed and verified prior to usage.

78. Contractor to setup workshop or tie up with external agency for repairs of machines, motors etc and also ensure minimum surplus (quantity to be mentioned in bid) of certain items for maintaining productivity. Contractor shall prepare daily log book for the availability of resource and back-up plan for its mitigation.

79. Soft Ware:-
    - Composite Contractor to use Software for Material Management till System handover.
    - Composite Contractor to have own;
        - Data Centre Facility
        - Server Application
        - Connectivity-Client Software to access Data Centre.
        - Own Lease Line for resource connectivity from Contractor Data Centre to client & Specific URL to be provided (Global Public URL) to provide client access as & when required.

80. Work Permit
    Issue of work permit will be as below:

    a) Within the construction area segregated from operational area where work is to be executed for project completion, contractors & Consultant shall follow approved permit system finalized & agreed with BPCL. Consultant shall directly issue the work permits to contractors.

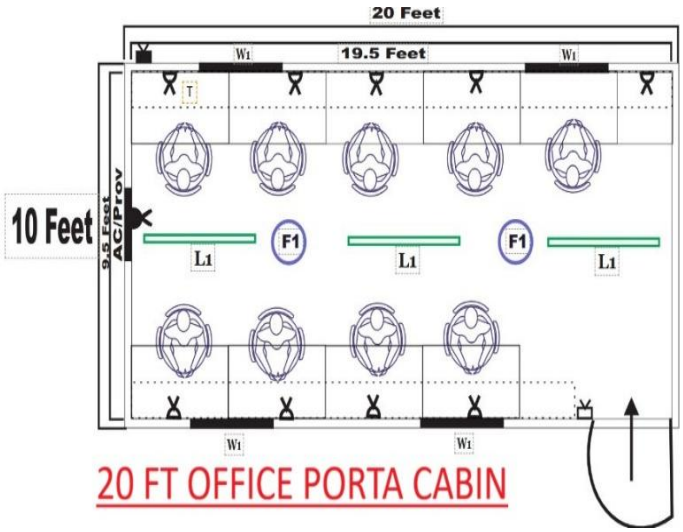
    b) Work permit system for all hook up / tie up jobs and within operational area shall be as per enforced work permit system of BPCL Bina Refinery. Within operational area

work permits shall be issued by Bina Refinery to respective contractors which have to be signed by consultant also.

The EIL site team, in coordination with BPCL, shall prepare and finalize the modality of the Work Permit System for the non-operational area. Same to be followed by contractor during execution.

81. REQUIREMENTS TO BE ADHERED BY CONTRACTOR AT SITE FOR EXECUTION OF WORKS

1. 4 nos of 20 feet Porta Cabin with Amenities (Table/Chairs/Acs) to be provided at site for EIL/Client use (Standard layout attached for reference). Refer sketch below for porta cabin.
2. Provision and execution of temporary lifts required for mechanical works will be kept.
3. Contractor shall fabricate/procure hoses for all pre-commissioning, commissioning, and LO flushing activities as instructed by EIC.
4. Certified scaffolding inspectors(min 4 numbers) shall be deployed. Scaffolding materials shall be certified and zone-wise scaffolding teams segregated for better control.
5. For material issued to contractor: Contractor's scope shall include pickup of issued materials from BPCL/EIL stores within plant premises as instructed by EIC, without any cost or time implications.
6. DigiBPREP platform shall be mandated for all project reporting, submittals, inspections, NCRs, punch lists, progress updates and documentation as required by BPCL.
7. All contractor personnel shall possess VKBR medical certification in accordance with prevailing BPCL guidelines and maintain validity throughout execution.



Symbol	Qountity.	Size	Description.
D1	1	3'x6.5'	Main Entry Door
W1	4	3'x3''	Sliding Glass Window
L1	3	4'	LED Lights
F1	2	-	Wall mounted Fans
	1	6 Modular Plate	Main board for Tube Lite, Fan & Blockhead Switches
	9	6 Modular plate	2Nos. 5Amp Switch and Socket
	1	2 Way box	32 Amp MCB
	2	3 Modular Plate	2 Nos. 15 Amp Switch & Socket

BIDDING DOCUMENT

FOR

COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

(BIDDING DOCUMENT NO.: JP/B957-999-PK-T-9501/1031)

PROJECT: BINA PETCHEM AND REFINERY EXPANSION PROJECT (BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PART-II OF III : PRICED PART

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)

ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

Name of Work : COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

Bidding Document No.: JP/B957-999-PK-T-9501/1031

SCHEDULE OF RATES

Name of Work : COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

Bidding Document No.: JP/B957-999-PK-T-9501/1031

PREAMBLE TO SCHEDULE OF RATES

1.0 The Schedule of Rates shall be read in conjunction with all other sections of this Bidding Document.

2.0 The Contractor is deemed to have studied the drawings, specifications and details of works to be done within the Time Schedule and should have acquainted himself of the conditions prevailing at site.

3.0 The quantities shown against the various items are only approximate and may vary to any extent individually subject to conditions given in General Terms & Conditions of Contract/Special Conditions of Contract.

4.0 No claim shall be entertained during currency of this Contract towards any items due to the above including where the CONTRACTOR has quoted low/ high rates.

5.0 EIL/OWNER reserves the right to interpolate or extrapolate the rates for any new item of work not covered in Schedule of Rates from the similar items already available in schedule of rates. In case any activity though specifically not covered in schedule of rates descriptions but the same is covered under scope of work/ scope of supply/ specification/ drawings etc. no extra claim on this account shall be entertained, since Schedule of Rates is to be read in conjunction with all other documents forming part of the Contract.

6.0 All items of work mentioned in the Schedule of Rates shall be carried out as per the specifications, drawings and instructions of EIL/ OWNER and the rates are deemed to be inclusive of material, consumable, labour, supervision, tools & tackles and detailing of construction/fabrication drawings, isometric wherever required as called for in the detail specification and conditions of the Contract.

7.0 Bidder shall furnish this Form duly filled in all respects along with his price part.

8.0 The quoted prices/rates shall be deemed to be inclusive of all taxes and duties except “Goods and Services Tax” (GST) as per Provisions of taxes & duties specified in SCC.

9.0 Any errors of interpretation of applicability of taxes/duties by bidders shall be to their account.

10.0 Employer/Consultant reserves the right to cancel/ delete/ curtail any item or group of work if necessary. Such a step shall not be construed as reason for changing the rates.

11.0 Bidders shall quote their prices as percentage [increase(+) (i.e. Above) /decrease(-) (i.e. Below) /Par] variation in Price Schedule format **Form SP-0** on Total estimated value in **BoQ1** Sheet of Price Schedule respectively for **Part-A and/or Part-B**. This percentage variation as quoted by the bidder will apply uniformly to all items of SOR during execution for the respective parts.

12.0 Bidder shall indicate only the Increase (i.e. Above) /Decrease (i.e. Below)/Par **(in Col.7)** on Total estimated value in terms of percentage **(in Col.9)** upto 2 decimal places in the “SUMMARY OF PRICES [SP-0]" i.e., Sheet BoQ1. Bidder shall not change the Pre-filled rate/ amount indicated in ‘Schedule of Rates’ [Refer FORM-SP-1].

Name of authorized person submitting the tender on behalf of the Bidder (s):	
Designation of authorized person:	
Name of firm / Contractor:	
Address of firm / Contractor:	
Date:	

(SIGNATURE & STAMP OF BIDDER)

Name of Work : COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

Bidding Document No.: JP/B957-999-PK-T-9501/1031

FORM SP-0

Validate Print Help

Item Wise BoQ (Form Based)

Tender Inviting Authority: EIL on Behalf of BPCL

Name of Work: COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & B) OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

Contract No: JP/B957-999-PK-T-9501/1031

Name of the Bidder/ Bidding Firm / Company :	

SUMMARY OF PRICE [FORM SP-0] FOR PART-A & PART-B

Note :

1. This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only.

2. If percentage is not quoted in Col. 9 of Form SP-0, it shall be considered "NIL" for price evaluation/award.

3. Bidder to select appropriate percentage option from "Percentage Option [Excess (+), Less (-)]"

4. Bidder's quoted prices in this FORM SP-0 shall be loaded with GST@18% during evaluation.

NUMBER #	TEXT #	TEXT #	NUMBER	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Units	Estimated Rate in INR	Percentage Option (Above/ Below/ At Par) (to be selected by Bidder)	Percentage Rate to be entered by the Bidder in P %	TOTAL AMOUNT inclusive of all taxes and duties excluding GST in INR	TOTAL AMOUNT In Words
1	2	5	6	7	9	11	13
1	**COMPOSITE WORKS FOR UTILITIES & OFF-SITES**						
1.01	**Part-A : (West side of Nallah)** (For Details Refer Form SP-1)	Total Estimated Value	**4245229519.00**	Select		**0.00**	INR Zero Only
1.02	**Part-B : (East side of Nallah + BDT)** (For Details Refer Form SP-1)	Total Estimated Value	**2852433266.00**	Select		**0.00**	INR Zero Only

Name of Work : COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

Bidding Document No.: JP/B957-999-PK-T-9501/1031

FORM SP-1
PRE-FILLED SCHEDULE OF RATES

[All rates / Amount in Indian Rupees (INR)]

SCHEDULE OF RATES

BIDDING DOC NO	
BIDDER NAME	
JOB NO	B957
TENDER TITLE	Composite works Utilities & Offsite (PART-A & B)
CLIENT	BPCL
PROJECT	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP

While quoting and filling the rate in this Schedule of Rates, Bidder shall take into consideration complete scope of work for the relevant item, provided in the Bidding Document. The rate quoted in Schedule of Rates shall be deemed to include all activities of work mentioned in item description of Schedule of Rates .
Bidders are requested to fill in the RATE column only

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1	A	B957-999-06-45-PK-SOR-9501-A-0M	01CT	CATHODIC PROTECTION					
2	A	B957-999-06-45-PK-SOR-9501-A-0M	01CT.MI0	Cathodic Protection System for Plant:					
3	A	B957-999-06-45-PK-SOR-9501-A-0M	01CT.MI0.1	Survey, Design, Detail Engineering, Supply, installation, testing, commissioning, etc of the cathodic protection system for the buried facilities. All work shall be carried out conforming to the scope of work, design basis, data sheets, specifications, standards, drawings, etc as per the provisions of GCC, SCC and specification no: B957-999-06-45-CSP-9501, Rev. 0.	1	Lumpsum		13242550	13242550
4	A	B957-999-16-43-PK-SOR-9501-A-3M	M20000000000	PIPING-OFFSITES					
5	A	B957-999-16-43-PK-SOR-9501-A-3M	M20900000000	PIPING (ABOVE GROUND) :-Transportation of all piping items from Owners storage point to work site/work shop; fabrication including cutting, edge preparation, (inclusive of grinding the edges of pipe, pipe spools, fittings, flanges etc. to match with the mating edges of uneven/different thickness wherever required); fitup, bending, preheating wherever required, welding, threading, and laying of pipes and pipe spools (spools along with supports) of all types and thickness over sleepers, overhead on racks and at all elevations, hook-ups with existing piping, connecting with equipment nozzles, strainers, steam traps, static mixers, sight flow indicators, thermal sleeve, orifice assemblies, spray nozzles, rotameters, tappings for pressure gauges, thermowells, sample connections, sample coolers, closed sample system cabinets etc. and fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fittings, like elbows, reducers, tees, flanges, spectacle blinds and spacer and blinds, piping specials such as mitres and fabricated fittings, vents, drains (but excluding reinforcing pads), SW valves upto 1.5 NB, Steam Supply/ Condensate Recovery stations(Cast/Fabricated), Supply and welding of Strip as per EIL Std 7-51-0112 to all pipes before hydro-testing at exit points of Units for earthing purpose; alignment, cleaning and flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified draining, drying by compressed air, performing Positive Material Identification(PMI) using alloy analysers, completing all such works in all respects (including preparation of isometrics as mentioned in the Scope of Work for the job) as per the specifications, drawings and instructions of Engineer-in-Charge. PMI shall be performed by third party as defined in PMI spec.Rates for tubing (if any) shall include rates for valves, fittings, all in line instruments and testing etc. Carbon steel piping includes LTCS piping also. Erection of all inline instruments like flow instruments and specialty items like static mixers, sample coolers, thermal sleeve, air mixers, exhaust head, rupture disk, flow meters, venturi tube, flame arrestor, thermal flow switch etc. except valve shall be considered as part of piping and separate payment shall not be made on this account. Note : Contractor to refer to Instrumentation SOR for specific details and rates of Instrumentation items not covered herein.					
6	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901000000	CARBON STEEL PIPING (NON IBR); THK. <= 10MM					
7	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901010000	FABRICATION (BUTT WELD- MANUAL)					
8	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901019100	NB UPTO 1.5 INCH	295	Inch Dia		800	236000
9	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901019200	NB 2 INCH - 6 INCH	67060	Inch Dia		800	53648000
10	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901019300	NB 8 INCH - 14 INCH	48630	Inch Dia		800	38904000
11	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901019400	NB 16 INCH - 24 INCH	35395	Inch Dia		800	28316000
12	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901019500	NB 26 INCH - 36 INCH	25560	Inch Dia		800	20448000
13	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901020000	FABRICATION (FILLET WELD)					
14	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901029100	NB UPTO 1.5 INCH	2065	Inch Dia		670	1383550
15	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901029200	NB 2 INCH - 6 INCH	180	Inch Dia		670	120600
16	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901029300	NB 8 INCH - 14 INCH	380	Inch Dia		670	254600
17	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901029400	NB 16 INCH - 24 INCH	75	Inch Dia		670	50250
18	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901029500	NB 26 INCH - 36 INCH	35	Inch Dia		670	23450
19	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
20	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901039300	NB 8 INCH - 14 INCH	20840	Inch Dia		960	20006400
21	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901039400	NB 16 INCH - 24 INCH	15170	Inch Dia		960	14563200
22	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901039500	NB 26 INCH - 36 INCH	10955	Inch Dia		960	10516800
23	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901040000	ERECTION (OTHER THAN SPOOL)					
24	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901049100	NB UPTO 1.5 INCH	690	Inch M		290	200100
25	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901049200	NB 2 INCH - 6 INCH	359740	Inch M		290	104324600
26	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901049300	NB 8 INCH - 14 INCH	469680	Inch M		290	136207200
27	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901049400	NB 16 INCH - 24 INCH	343260	Inch M		290	99545400
28	A	B957-999-16-43-PK-SOR-9501-A-3M	M20901049500	NB 26 INCH - 36 INCH	273305	Inch M		300	81991500

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
29	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902000000	CARBON STEEL PIPING (NON IBR); THK. > 10MM AND <= 20MM					
30	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902010000	FABRICATION (BUTT WELD- MANUAL)					
31	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019200	NB 2 INCH - 6 INCH	3755	Inch Dia		940	3529700
32	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019300	NB 8 INCH - 14 INCH	10335	Inch Dia		940	9714900
33	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019400	NB 16 INCH - 24 INCH	6085	Inch Dia		940	5719900
34	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019500	NB 26 INCH - 36 INCH	1105	Inch Dia		940	1038700
35	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019600	NB 38 INCH - 48 INCH	5855	Inch Dia		940	5503700
36	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019700	NB 50 INCH - 60 INCH	16970	Inch Dia		940	15951800
37	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902019800	ABOVE 60 INCH	14680	Inch Dia		940	13799200
38	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
39	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039300	NB 8 INCH - 14 INCH	4430	Inch Dia		1140	5050200
40	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039400	NB 16 INCH - 24 INCH	2610	Inch Dia		1140	2975400
41	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039500	NB 26 INCH - 36 INCH	475	Inch Dia		1140	541500
42	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039600	NB 38 INCH - 48 INCH	2510	Inch Dia		1140	2861400
43	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039700	NB 50 INCH - 60 INCH	7275	Inch Dia		1140	8293500
44	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902039800	ABOVE 60 INCH	6295	Inch Dia		1140	7176300
45	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902040000	ERECTION (OTHER THAN SPOOL)					
46	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049200	NB 2 INCH - 6 INCH	13405	Inch M		300	4021500
47	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049300	NB 8 INCH - 14 INCH	90015	Inch M		300	27004500
48	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049400	NB 16 INCH - 24 INCH	56715	Inch M		300	17014500
49	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049500	NB 26 INCH - 36 INCH	11105	Inch M		300	3331500
50	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049600	NB 38 INCH - 48 INCH	60265	Inch M		330	19887450
51	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049700	NB 50 INCH - 60 INCH	161330	Inch M		330	53238900
52	A	B957-999-16-43-PK-SOR-9501-A-3M	M20902049800	ABOVE 60 INCH	156590	Inch M		330	51674700
53	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906000000	CARBON STEEL PIPING (IBR); THK. <= TO 10MM					
54	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906010000	FABRICATION (BUTT WELD- MANUAL)					
55	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906019100	NB UPTO 1.5 INCH	55	Inch Dia		870	47850
56	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906019200	NB 2 INCH - 6 INCH	2815	Inch Dia		870	2449050
57	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906019300	NB 8 INCH - 14 INCH	9335	Inch Dia		870	8121450
58	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906019400	NB 16 INCH - 24 INCH	6825	Inch Dia		870	5937750
59	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906019500	NB 26 INCH - 36 INCH	10245	Inch Dia		870	8913150
60	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906020000	FABRICATION (FILLET WELD)					
61	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906029100	NB UPTO 1.5 INCH	275	Inch Dia		770	211750
62	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
63	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906039300	NB 8 INCH - 14 INCH	4000	Inch Dia		1040	4160000
64	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906039400	NB 16 INCH - 24 INCH	2925	Inch Dia		1040	3042000
65	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906039500	NB 26 INCH - 36 INCH	4390	Inch Dia		1040	4565600
66	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906040000	ERECTION (OTHER THAN SPOOL)					
67	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906049100	NB UPTO 1.5 INCH	190	Inch M		290	55100
68	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906049200	NB 2 INCH - 6 INCH	10940	Inch M		290	3172600
69	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906049300	NB 8 INCH - 14 INCH	60565	Inch M		290	17563850
70	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906049400	NB 16 INCH - 24 INCH	39145	Inch M		290	11352050
71	A	B957-999-16-43-PK-SOR-9501-A-3M	M20906049500	NB 26 INCH - 36 INCH	54730	Inch M		300	16419000
72	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907000000	CARBON STEEL PIPING (IBR); THK. > 10MM AND <= 20MM					
73	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907010000	FABRICATION (BUTT WELD- MANUAL)					
74	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907019200	NB 2 INCH - 6 INCH	1085	Inch Dia		1020	1106700
75	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907019300	NB 8 INCH - 14 INCH	2990	Inch Dia		1020	3049800
76	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907019400	NB 16 INCH - 24 INCH	13950	Inch Dia		1020	14229000
77	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907019500	NB 26 INCH - 36 INCH	2360	Inch Dia		1020	2407200
78	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
79	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907039300	NB 8 INCH - 14 INCH	1285	Inch Dia		1220	1567700
80	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907039400	NB 16 INCH - 24 INCH	5980	Inch Dia		1220	7295600
81	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907039500	NB 26 INCH - 36 INCH	1010	Inch Dia		1220	1232200
82	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907040000	ERECTION (OTHER THAN SPOOL)					
83	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907049200	NB 2 INCH - 6 INCH	4795	Inch M		300	1438500

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
84	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907049300	NB 8 INCH - 14 INCH	16225	Inch M		300	4867500
85	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907049400	NB 16 INCH - 24 INCH	75180	Inch M		300	22554000
86	A	B957-999-16-43-PK-SOR-9501-A-3M	M20907049500	NB 26 INCH - 36 INCH	12435	Inch M		300	3730500
87	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911000000	STAINLESS STEEL PIPING (NON-IBR); THK. <= 10MM					
88	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911010000	FABRICATION (BUTT WELD- MANUAL)					
89	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911019100	NB UPTO 1.5 INCH	15	Inch Dia		1570	23550
90	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911019200	NB 2 INCH - 6 INCH	9215	Inch Dia		1570	14467550
91	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911019300	NB 8 INCH - 14 INCH	5210	Inch Dia		1570	8179700
92	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911019400	NB 16 INCH - 24 INCH	5	Inch Dia		1570	7850
93	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911019500	NB 26 INCH - 36 INCH	3140	Inch Dia		1570	4929800
94	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911020000	FABRICATION (FILLET WELD)					
95	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911029100	NB UPTO 1.5 INCH	75	Inch Dia		1270	95250
96	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
97	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911039300	NB 8 INCH - 14 INCH	2235	Inch Dia		1890	4224150
98	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911039400	NB 16 INCH - 24 INCH	5	Inch Dia		1890	9450
99	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911039500	NB 26 INCH - 36 INCH	1345	Inch Dia		1890	2542050
100	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911040000	ERECTION (OTHER THAN SPOOL)					
101	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911049100	NB UPTO 1.5 INCH	95	Inch M		370	35150
102	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911049200	NB 2 INCH - 6 INCH	63025	Inch M		370	23319250
103	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911049300	NB 8 INCH - 14 INCH	48520	Inch M		370	17952400
104	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911049400	NB 16 INCH - 24 INCH	115	Inch M		370	42550
105	A	B957-999-16-43-PK-SOR-9501-A-3M	M20911049500	NB 26 INCH - 36 INCH	30655	Inch M		370	11342350
106	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912000000	STAINLESS STEEL PIPING (NON-IBR); THK. > 10MM AND <= 20MM					
107	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912010000	FABRICATION (BUTT WELD- MANUAL)					
108	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912019600	NB 38 INCH - 48 INCH	1410	Inch Dia		1980	2791800
109	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
110	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912039600	NB 38 INCH - 48 INCH	605	Inch Dia		2380	1439900
111	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912040000	ERECTION (OTHER THAN SPOOL)					
112	A	B957-999-16-43-PK-SOR-9501-A-3M	M20912049600	NB 38 INCH - 48 INCH	12385	Inch M		430	5325550
113	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918000000	STAINLESS STEEL PIPING (IBR); THK. <= 10MM					
114	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918010000	FABRICATION (BUTT WELD- MANUAL)					
115	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918019200	NB 2 INCH - 6 INCH	2215	Inch Dia		1690	3743350
116	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918019300	NB 8 INCH - 14 INCH	725	Inch Dia		1690	1225250
117	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918020000	FABRICATION (FILLET WELD)					
118	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918029100	NB UPTO 1.5 INCH	70	Inch Dia		1540	107800
119	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
120	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918039300	NB 8 INCH - 14 INCH	310	Inch Dia		2040	632400
121	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918040000	ERECTION (OTHER THAN SPOOL)					
122	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918049100	NB UPTO 1.5 INCH	5	Inch M		370	1850
123	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918049200	NB 2 INCH - 6 INCH	13410	Inch M		370	4961700
124	A	B957-999-16-43-PK-SOR-9501-A-3M	M20918049300	NB 8 INCH - 14 INCH	6550	Inch M		370	2423500
125	A	B957-999-16-43-PK-SOR-9501-A-3M	M20931050000	ERECTION (SPOOL)					
126	A	B957-999-16-43-PK-SOR-9501-A-3M	M20931059100	NB UPTO 1.5 INCH	5	Inch M		370	1850
127	A	B957-999-16-43-PK-SOR-9501-A-3M	M20931059200	NB 2 INCH - 6 INCH	20	Inch M		370	7400
128	A	B957-999-16-43-PK-SOR-9501-A-3M	M20931059300	NB 8 INCH - 14 INCH	10	Inch M		370	3700
129	A	B957-999-16-43-PK-SOR-9501-A-3M	M20932050000	ERECTION (SPOOL)					
130	A	B957-999-16-43-PK-SOR-9501-A-3M	M20932059200	NB 2 INCH - 6 INCH	10	Inch M		370	3700
131	A	B957-999-16-43-PK-SOR-9501-A-3M	M20933050000	ERECTION (SPOOL)					
132	A	B957-999-16-43-PK-SOR-9501-A-3M	M20933059300	NB 8 INCH - 14 INCH	1220	Inch M		370	451400
133	A	B957-999-16-43-PK-SOR-9501-A-3M	M20934050000	ERECTION (SPOOL)					
134	A	B957-999-16-43-PK-SOR-9501-A-3M	M20934059400	NB 16 INCH - 24 INCH	22365	Inch M		370	8275050
135	A	B957-999-16-43-PK-SOR-9501-A-3M	M20944000000	STEAM TRACERS CARBON STEEL					
136	A	B957-999-16-43-PK-SOR-9501-A-3M	M20944000400	NB 0.500 INCHES	15	Metres		910	13650
137	A	B957-999-16-43-PK-SOR-9501-A-3M	M20944000600	NB 1.000 INCHES	15	Metres		910	13650
138	A	B957-999-16-43-PK-SOR-9501-A-3M	M20944000800	NB 1.500 INCHES	15	Metres		1360	20400

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
139	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991000000	ALLOY STEEL P91 PIPING (IBR); THK. <= 10MM					
140	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991010000	FABRICATION (BUTT WELD- MANUAL)					
141	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991019100	NB UPTO 1.5 INCH	15	Inch Dia		1510	22650
142	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991019200	NB 2 INCH - 6 INCH	40	Inch Dia		1510	60400
143	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
144	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991040000	ERECTION (OTHER THAN SPOOL)					
145	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991049100	NB UPTO 1.5 INCH	5	Inch M		330	1650
146	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991049200	NB 2 INCH - 6 INCH	20	Inch M		330	6600
147	A	B957-999-16-43-PK-SOR-9501-A-3M	M20991049300	NB 8 INCH - 14 INCH	10	Inch M		330	3300
148	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992000000	ALLOY STEEL P91 PIPING (IBR); THK. > 10MM AND <= 20MM					
149	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992010000	FABRICATION (BUTT WELD- MANUAL)					
150	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992019200	NB 2 INCH - 6 INCH	15	Inch Dia		1930	28950
151	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
152	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992040000	ERECTION (OTHER THAN SPOOL)					
153	A	B957-999-16-43-PK-SOR-9501-A-3M	M20992049200	NB 2 INCH - 6 INCH	10	Inch M		370	3700
154	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993000000	ALLOY STEEL P91 PIPING (IBR); THK. > 20MM AND <= 30MM					
155	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993010000	FABRICATION (BUTT WELD- MANUAL)					
156	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993019300	NB 8 INCH - 14 INCH	605	Inch Dia		2510	1518550
157	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
158	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993039300	NB 8 INCH - 14 INCH	260	Inch Dia		2740	712400
159	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993040000	ERECTION (OTHER THAN SPOOL)					
160	A	B957-999-16-43-PK-SOR-9501-A-3M	M20993049300	NB 8 INCH - 14 INCH	1220	Inch M		430	524600
161	A	B957-999-16-43-PK-SOR-9501-A-3M	M20994000000	ALLOY STEEL P91 PIPING (IBR); THK. > 30MM AND <= 40MM					
162	A	B957-999-16-43-PK-SOR-9501-A-3M	M20994010000	FABRICATION (BUTT WELD- MANUAL)					
163	A	B957-999-16-43-PK-SOR-9501-A-3M	M20994019400	NB 16 INCH - 24 INCH	4190	Inch Dia		3270	13701300
164	A	B957-999-16-43-PK-SOR-9501-A-3M	M20994030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
165	A	B957-999-16-43-PK-SOR-9501-A-3M	M20994039400	NB 16 INCH - 24 INCH	1795	Inch Dia		3560	6390200
166	A	B957-999-16-43-PK-SOR-9501-A-3M	M21600000000	VALVES :- Transportation of all types of valves (Including special valves and motor operated valves) from Owners storage points to contractors stores/worksite and installation of valves for all rating including assembly of valves accessories like air bottles etc, if any, fixing of gaskets bolts/nuts wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge. Note : For PRDS, PSVs, TSVs, Control valves, On-Off/Shutdown valves and Self actuating valves all details and rates shall be as per Instrumentation SOR.					
167	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601000000	FLANGED/WAFER VALVES INCLUDING MOV (UPTO 600#)					
168	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601000400	NB 0.500 INCHES	5	Nos		630	3150
169	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601000500	NB 0.750 INCHES	55	Nos		630	34650
170	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601000600	NB 1.000 INCHES	16	Nos		630	10080
171	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601000900	NB 2.000 INCHES	185	Nos		990	183150
172	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001100	NB 3.000 INCHES	146	Nos		1480	216080
173	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001300	NB 4.000 INCHES	137	Nos		1970	269890
174	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001500	NB 6.000 INCHES	179	Nos		2960	529840
175	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001600	NB 8.000 INCHES	66	Nos		3940	260040
176	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001700	NB 10.000 INCHES	13	Nos		4930	64090
177	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001800	NB 12.000 INCHES	30	Nos		5910	177300
178	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601001900	NB 14.000 INCHES	1	Nos		6900	6900
179	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002000	NB 16.000 INCHES	1	Nos		7880	7880
180	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002100	NB 18.000 INCHES	10	Nos		8870	88700
181	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002200	NB 20.000 INCHES	3	Nos		9860	29580
182	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002400	NB 24.000 INCHES	3	Nos		11830	35490
183	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002500	NB 26.000 INCHES	1	Nos		12810	12810
184	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002700	NB 30.000 INCHES	1	Nos		18960	18960
185	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601002800	NB 32.000 INCHES	1	Nos		20220	20220
186	A	B957-999-16-43-PK-SOR-9501-A-3M	M21601003000	NB 36.000 INCHES	1	Nos		22750	22750
187	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606000000	CARBON STEEL BW VALVES INCLUDING MOV (IBR)					
188	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606000400	NB 0.500 INCHES	5	Nos		1240	6200
189	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606000500	NB 0.750 INCHES	18	Nos		1240	22320
190	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606000600	NB 1.000 INCHES	1	Nos		1240	1240

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
191	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606001100	NB 3.000 INCHES	20	Nos		3020	60400
192	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606001300	NB 4.000 INCHES	5	Nos		4030	20150
193	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606001900	NB 14.000 INCHES	3	Nos		14100	42300
194	A	B957-999-16-43-PK-SOR-9501-A-3M	M21606002000	NB 16.000 INCHES	3	Nos		16110	48330
195	A	B957-999-16-43-PK-SOR-9501-A-3M	M21900000000	SPRING SUPPORT ASSEMBLIES :- Transportation of all types of spring support assemblies from Owner's storage points to contractor's stores/worksite and installation of spring support assemblies for all rating including assembly, if any, fixing of gaskets bolts/nuts, welding attachments wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge. Contractor to ensure that travel stops are removed and spring is locked in cold load position for Hydrotest. It shall be ensured that locking devices are removed and springs are properly set at hot load position during commissioning.					
196	A	B957-999-16-43-PK-SOR-9501-A-3M	M21901000000		4	MT		74980	299920
197	A	B957-999-16-43-PK-SOR-9501-A-3M	M22000000000	BOLT TENSIONING :- Carrying out tensioning of bolted joints on all types of piping as called for in EIL Specification No.6-76-0002 on already erected system including supply of all materials, recording devices, instruments etc; Providing all normal and special equipment and gadgets, skilled / un skilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of engineer-in-charge. some joints may require bolt tensioning more than once, but, payment for one joint shall be made only once.					
198	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001000000	150# JOINTS					
199	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001001900	NB 14.000 INCHES	3	Nos		4800	14400
200	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002000	NB 16.000 INCHES	1	Nos		5480	5480
201	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002100	NB 18.000 INCHES	26	Nos		6170	160420
202	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002200	NB 20.000 INCHES	31	Nos		6860	212660
203	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002400	NB 24.000 INCHES	16	Nos		8230	131680
204	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002600	NB 28.000 INCHES	16	Nos		9600	153600
205	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001002700	NB 30.000 INCHES	3	Nos		10280	30840
206	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001003200	NB 40.000 INCHES	5	Nos		19710	98550
207	A	B957-999-16-43-PK-SOR-9501-A-3M	M22001004200	NB 60.000 INCHES	3	Nos		29570	88710
208	A	B957-999-16-43-PK-SOR-9501-A-3M	M22002000000	300# JOINTS					
209	A	B957-999-16-43-PK-SOR-9501-A-3M	M22002001700	NB 10.000 INCHES	18	Nos		4930	88740
210	A	B957-999-16-43-PK-SOR-9501-A-3M	M22002001800	NB 12.000 INCHES	103	Nos		5910	608730
211	A	B957-999-16-43-PK-SOR-9501-A-3M	M22002002200	NB 20.000 INCHES	1	Nos		9860	9860
212	A	B957-999-16-43-PK-SOR-9501-A-3M	M22002002500	NB 26.000 INCHES	3	Nos		12810	38430
213	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004000000	600# JOINTS					
214	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004001500	NB 6.000 INCHES	100	Nos		3790	379000
215	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004001600	NB 8.000 INCHES	57	Nos		5060	288420
216	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004001700	NB 10.000 INCHES	60	Nos		6320	379200
217	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004001800	NB 12.000 INCHES	8	Nos		7580	60640
218	A	B957-999-16-43-PK-SOR-9501-A-3M	M22004002100	NB 18.000 INCHES	1	Nos		11380	11380
219	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006000000	1500# JOINTS					
220	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006000800	NB 1.500 INCHES	3	Nos		1410	4230
221	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006000900	NB 2.000 INCHES	10	Nos		1890	18900
222	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006001100	NB 3.000 INCHES	20	Nos		2830	56600
223	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006001300	NB 4.000 INCHES	7	Nos		3770	26390
224	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006001500	NB 6.000 INCHES	5	Nos		5660	28300
225	A	B957-999-16-43-PK-SOR-9501-A-3M	M22006001800	NB 12.000 INCHES	49	Nos		11310	554190
226	A	B957-999-16-43-PK-SOR-9501-A-3M	M22100000000	REINFORCING PADS FOR PIPES :- Fabrication of reinforcing pads for pipe connection wherever required (from pipes only supplied by the Owner) and erection, fitup, welding and testing (including DP/MP) if required of the same and performing Positive Material Identification(PMI) using alloy analysers as per the specifications, drawings and instructions of the Engineer-in-Charge. Note: Sizes mentioned for Reinforcing Pads are for branch pipe					
227	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101000000	C.S REINFORCING PADS					
228	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101000900	NB 2.000 INCHES	18	Nos		2740	49320
229	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001100	NB 3.000 INCHES	4	Nos		4110	16440
230	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001300	NB 4.000 INCHES	13	Nos		5480	71240
231	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001500	NB 6.000 INCHES	31	Nos		8230	255130
232	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001600	NB 8.000 INCHES	18	Nos		10970	197460
233	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001700	NB 10.000 INCHES	8	Nos		13710	109680
234	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101001800	NB 12.000 INCHES	20	Nos		16450	329000
235	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101002100	NB 18.000 INCHES	1	Nos		24680	24680
236	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101002200	NB 20.000 INCHES	7	Nos		27420	191940

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
237	A	B957-999-16-43-PK-SOR-9501-A-3M	M22101002400	NB 24.000 INCHES	1	Nos		37020	37020
238	A	B957-999-16-43-PK-SOR-9501-A-3M	M22103000000	S.S REINFORCING PADS					
239	A	B957-999-16-43-PK-SOR-9501-A-3M	M22103001500	NB 6.000 INCHES	3	Nos		14590	43770
240	A	B957-999-16-43-PK-SOR-9501-A-3M	M22103001600	NB 8.000 INCHES	1	Nos		19450	19450
241	A	B957-999-16-43-PK-SOR-9501-A-3M	M22103001700	NB 10.000 INCHES	3	Nos		24320	72960
242	A	B957-999-16-43-PK-SOR-9501-A-3M	M22200000000	RADIOGRAPHY :- Performance of radiographic inspection on piping of all types and thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge. Radiographs shall be submitted to the Engineer-in-charge. (Repeat Radiography due to defective radiograph on repaired joints due to Contractors fault and for additional radiography necessitated due to poor performance of contractors welders shall be done at contractors cost) Note: Unit for radiography quantity is Nos of circumferencial weld joints.					
243	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201000000	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
244	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201000500	NB 0.750 INCHES	25	Nos		490	12250
245	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201000600	NB 1.000 INCHES	4	Nos		490	1960
246	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201000800	NB 1.500 INCHES	3	Nos		510	1530
247	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201000900	NB 2.000 INCHES	265	Nos		690	182850
248	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201001100	NB 3.000 INCHES	293	Nos		1030	301790
249	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201001300	NB 4.000 INCHES	425	Nos		1370	582250
250	A	B957-999-16-43-PK-SOR-9501-A-3M	M22201001500	NB 6.000 INCHES	329	Nos		2060	677740
251	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202000000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
252	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202000500	NB 0.750 INCHES	13	Nos		490	6370
253	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202000600	NB 1.000 INCHES	7	Nos		490	3430
254	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202000800	NB 1.500 INCHES	9	Nos		510	4590
255	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202000900	NB 2.000 INCHES	51	Nos		690	35190
256	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001100	NB 3.000 INCHES	164	Nos		1030	168920
257	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001300	NB 4.000 INCHES	4	Nos		1370	5480
258	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001500	NB 6.000 INCHES	1186	Nos		2060	2443160
259	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001600	NB 8.000 INCHES	166	Nos		2740	454840
260	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001700	NB 10.000 INCHES	8	Nos		3430	27440
261	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202001900	NB 14.000 INCHES	27	Nos		4800	129600
262	A	B957-999-16-43-PK-SOR-9501-A-3M	M22202002700	NB 30.000 INCHES	194	Nos		10280	1994320
263	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203000000	FOR JOINTS ABOVE THK. 8MM					
264	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203000400	NB 0.500 INCHES	8	Nos		490	3920
265	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203000500	NB 0.750 INCHES	34	Nos		490	16660
266	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203000600	NB 1.000 INCHES	3	Nos		490	1470
267	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203000900	NB 2.000 INCHES	26	Nos		690	17940
268	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001100	NB 3.000 INCHES	57	Nos		1030	58710
269	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001300	NB 4.000 INCHES	174	Nos		1370	238380
270	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001500	NB 6.000 INCHES	144	Nos		2060	296640
271	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001600	NB 8.000 INCHES	516	Nos		2740	1413840
272	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001700	NB 10.000 INCHES	125	Nos		3430	428750
273	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001800	NB 12.000 INCHES	290	Nos		4110	1191900
274	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203001900	NB 14.000 INCHES	35	Nos		4800	168000
275	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002000	NB 16.000 INCHES	29	Nos		5480	158920
276	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002100	NB 18.000 INCHES	47	Nos		6170	289990
277	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002200	NB 20.000 INCHES	21	Nos		6860	144060
278	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002400	NB 24.000 INCHES	462	Nos		8230	3802260
279	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002500	NB 26.000 INCHES	14	Nos		8910	124740
280	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002600	NB 28.000 INCHES	59	Nos		9600	566400
281	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203002800	NB 32.000 INCHES	7	Nos		10970	76790
282	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203003000	NB 36.000 INCHES	18	Nos		12340	222120
283	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203003200	NB 40.000 INCHES	1	Nos		13710	13710
284	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203003600	NB 48.000 INCHES	52	Nos		16450	855400
285	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203004000	NB 56.000 INCHES	8	Nos		19200	153600
286	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203004200	NB 60.000 INCHES	20	Nos		20570	411400
287	A	B957-999-16-43-PK-SOR-9501-A-3M	M22203005900	NB 94.000 INCHES	16	Nos		32220	515520

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
288	A	B957-999-16-43-PK-SOR-9501-A-3M	M22300000000	DYE PENETRATION/MAGNETIC PARTICLE TEST :- Performance of magnetic particle/ dye penetrant test including supply of all necessary materials, equipment and labour for carrying out the work as per specification and directions of Engineer-in-Charge.					
289	A	B957-999-16-43-PK-SOR-9501-A-3M	M22301000000	DYE PENETRANT TEST	6260	Inches		90	563400
290	A	B957-999-16-43-PK-SOR-9501-A-3M	M22302000000	MAGNETIC PARTICLE TEST	1105	Inches		130	143650
291	A	B957-999-16-43-PK-SOR-9501-A-3M	M22400000000	PIPE SUPPORTS (FROM MATERIALS SUPPLIED BY OWNER) :- Fabrication, erection(at all elevations) of pipe supports like shoes, cradles, hangers, clamps(of all sizes/thicknesses manufactured by forming method using die), turn buckles, saddles, guides, special supports, pads(including corrosion pads & protection shields), providing and welding of stiffeners as per drawings, T post etc. of all types including supply and application one coat of primer, all necessary equipments, consumables, labour, returning surplus materials and scrap etc to owners storage points and completing work as per drawings, specifications and instructions of Engineer-in-charge. Modifications/rectifications, if required; and adjustment/ alignment during precommisioning, commisioning as per the instructions of Engineer-in-charge. Fabrication of extension of spindle for valves, provision of locking arrangement, etc. shall also be considered under this item.					
292	A	B957-999-16-43-PK-SOR-9501-A-3M	M22404000000	DUMMY PIPE SUPPORTS FOR C.S (OWNER SUPPLIED)	39	MT		73350	2860650
293	A	B957-999-16-43-PK-SOR-9501-A-3M	M22405000000	DUMMY PIPE SUPPORTS FOR S.S (OWNER SUPPLIED)	4	MT		146690	586760
294	A	B957-999-16-43-PK-SOR-9501-A-3M	M22406000000	DUMMY PIPE SUPPORTS FOR A.S (OWNER SUPPLIED)	1	MT		110020	110020
295	A	B957-999-16-43-PK-SOR-9501-A-3M	M22500000000	PIPE SUPPORTS (FROM MATERIALS SUPPLIED BY CONTRACTOR) :- Fabrication, erection(at all elevations) of pipe supports like shoes, cradles, hangers, clamps(of all sizes/thicknesses manufactured by forming method using die), turn buckles, saddles, guides, special supports, pads(including corrosion pads & protection shields), providing and welding of stiffeners as per drawings, T post etc. of all types including supply and application one coat of primer, all necessary equipments, consumables, labour, and completing work as per drawings, specifications and instructions of Engineer-in-charge. Modifications/rectifications, if required; and adjustment/ alignment during precommisioning, commisioning as per the instructions of Engineer-in-charge. Fabrication of extension of spindle for valves, provision of locking arrangement, etc. shall also be considered under this item.					
296	A	B957-999-16-43-PK-SOR-9501-A-3M	M22501000000	C.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	312	MT		136840	42694080
297	A	B957-999-16-43-PK-SOR-9501-A-3M	M22502000000	S.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	3	MT		410510	1231530
298	A	B957-999-16-43-PK-SOR-9501-A-3M	M22503000000	A.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	1	MT		361240	361240
299	A	B957-999-16-43-PK-SOR-9501-A-3M	M22600000000	HARDNESS TEST :- Carrying out hardness testing of weld joints on all types of piping as called for on shop / site fabricated already erected system including supply of all materials, instrument set., providing all normal and special equipment and gadgets, skilled / unskilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of engineer-in-charge. The joints under this head do not include Stress Relieved joints. Joints which do not meet the hardness requirement as per spec shall be stress relieved and re tested on contractors cost. No seperate payment shall be made for this. NOTE : Unit for hardness testing quantity is Nos. of Test Spots.					
300	A	B957-999-16-43-PK-SOR-9501-A-3M	M22601000000	NUMBER OF TEST SPOTS	8512	Nos		120	1021440
301	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000000	STRESS RELIEVING :- Carrying out stress relieving of weld joints, including all types of attachment welds (corrosion pads, protection shields, supports, etc.), as applicable, on all types of piping as called for on shop/site fabricated already erected system including supply of all materials, consumables recording devices, insulation materials, instruments etc., providing all normal and special equipment and gadgets, skilled/unskilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of Engineer-in-Charge. Repeat performance due to defective stress relieving or any other account shall be on Contractors cost. Payment shall be done only after submission and approval of charts. Stress relieving shall be followed by measurement of hardness and no separate payment shall be made for this. Note: Unit for stress relieving quantity is (Nos of circumferential weld joints)					
302	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000400	NB 0.500 INCHES	9	Nos		430	3870
303	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000500	NB 0.750 INCHES	69	Nos		430	29670
304	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000600	NB 1.000 INCHES	27	Nos		430	11610
305	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000800	NB 1.500 INCHES	9	Nos		510	4590
306	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700000900	NB 2.000 INCHES	164	Nos		490	80360
307	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700001100	NB 3.000 INCHES	1338	Nos		740	990120
308	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700001300	NB 4.000 INCHES	316	Nos		990	312840
309	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700001500	NB 6.000 INCHES	2947	Nos		1480	4361560
310	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700001600	NB 8.000 INCHES	3058	Nos		1970	6024260
311	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700001800	NB 12.000 INCHES	468	Nos		2960	1385280
312	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700002100	NB 18.000 INCHES	3	Nos		4430	13290
313	A	B957-999-16-43-PK-SOR-9501-A-3M	M22700002400	NB 24.000 INCHES	1286	Nos		5910	7600260
314	A	B957-999-16-43-PK-SOR-9501-A-3M	M22900000000	Ultrasonic Testing (UT) :- Performance of UT inspection on piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge. UT shall be submitted to the Engineer-in-charge. (Repeat UT due to defective UT on repaired joints due to Contractor's fault and for additional UT necessitated due to poor performance of contractor's welders shall be done at contractor's cost) Note: Unit for UT quantity is 'Nos of circumferencial weld joints'.					
315	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901000000	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
316	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901000500	NB 0.750 INCHES	1	Nos		550	550
317	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901000600	NB 1.000 INCHES	1	Nos		550	550

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
318	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901000800	NB 1.500 INCHES	3	Nos		820	2460
319	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901000900	NB 2.000 INCHES	23	Nos		1090	25070
320	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901001100	NB 3.000 INCHES	47	Nos		1650	77550
321	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901001300	NB 4.000 INCHES	47	Nos		2200	103400
322	A	B957-999-16-43-PK-SOR-9501-A-3M	M22901001500	NB 6.000 INCHES	53	Nos		3290	174370
323	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902000000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
324	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902000500	NB 0.750 INCHES	1	Nos		630	630
325	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902000600	NB 1.000 INCHES	1	Nos		630	630
326	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902000800	NB 1.500 INCHES	1	Nos		950	950
327	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902000900	NB 2.000 INCHES	4	Nos		1260	5040
328	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001100	NB 3.000 INCHES	21	Nos		1910	40110
329	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001300	NB 4.000 INCHES	1	Nos		2530	2530
330	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001500	NB 6.000 INCHES	1	Nos		3800	3800
331	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001600	NB 8.000 INCHES	1	Nos		5060	5060
332	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001700	NB 10.000 INCHES	1	Nos		6320	6320
333	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902001900	NB 14.000 INCHES	4	Nos		8850	35400
334	A	B957-999-16-43-PK-SOR-9501-A-3M	M22902002700	NB 30.000 INCHES	48	Nos		18960	910080
335	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903000000	FOR JOINTS ABOVE THK. 8MM					
336	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903000400	NB 0.500 INCHES	3	Nos		710	2130
337	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903000500	NB 0.750 INCHES	3	Nos		710	2130
338	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903000600	NB 1.000 INCHES	1	Nos		710	710
339	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903000900	NB 2.000 INCHES	3	Nos		1410	4230
340	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001100	NB 3.000 INCHES	10	Nos		2120	21200
341	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001300	NB 4.000 INCHES	31	Nos		2830	87730
342	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001500	NB 6.000 INCHES	23	Nos		4240	97520
343	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001600	NB 8.000 INCHES	52	Nos		5660	294320
344	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001700	NB 10.000 INCHES	23	Nos		7070	162610
345	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001800	NB 12.000 INCHES	22	Nos		8480	186560
346	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903001900	NB 14.000 INCHES	7	Nos		9910	69370
347	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002000	NB 16.000 INCHES	5	Nos		11320	56600
348	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002100	NB 18.000 INCHES	9	Nos		12740	114660
349	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002200	NB 20.000 INCHES	4	Nos		14140	56560
350	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002400	NB 24.000 INCHES	70	Nos		16980	1188600
351	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002500	NB 26.000 INCHES	3	Nos		18380	55140
352	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002600	NB 28.000 INCHES	10	Nos		19800	198000
353	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002700	NB 30.000 INCHES	1	Nos		21210	21210
354	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903002800	NB 32.000 INCHES	1	Nos		22620	22620
355	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903003000	NB 36.000 INCHES	4	Nos		25450	101800
356	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903003200	NB 40.000 INCHES	1	Nos		28280	28280
357	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903003600	NB 48.000 INCHES	13	Nos		33940	441220
358	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903004000	NB 56.000 INCHES	1	Nos		39590	39590
359	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903004200	NB 60.000 INCHES	4	Nos		42420	169680
360	A	B957-999-16-43-PK-SOR-9501-A-3M	M22903005900	NB 94.000 INCHES	3	Nos		66460	199380
361	A	B957-999-16-43-PK-SOR-9501-A-3M	M23000000000	CHEMICAL CLEANING/PICKLING :- Cleaning and pickling of equipment/pipeline includng preparation of circulation loop, supply of temporary piping, pumps, heater coils, gaskets, thermometer, hydrometer, valve, test coupon, spares, laboratory facilities, with all accessories for conducting test, chemicals, safety accessories and also providing or hiring all necessary equipment and whatever else even though not expressly mentioned herein and in specificaions but required to perform the work as per specifications and instructions of Engineer-in-Charge.					
362	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001000000	CHEMICAL CLEANING AND PASSIVATION FOR CS PIPING OF COMPRESSOR CIRCUIT					
363	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001000500	NB 0.750 INCHES	15	Metres		290	4350
364	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001000800	NB 1.500 INCHES	15	Metres		440	6600
365	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001000900	NB 2.000 INCHES	35	Metres		580	20300
366	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001001100	NB 3.000 INCHES	10	Metres		870	8700
367	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001001300	NB 4.000 INCHES	190	Metres		1160	220400
368	A	B957-999-16-43-PK-SOR-9501-A-3M	M23001001500	NB 6.000 INCHES	140	Metres		1740	243600
369	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003000000	PASSIVATION OF COOLING WATER LINES					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
370	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003000500	NB 0.750 INCHES	30	Metres		270	8100
371	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003000800	NB 1.500 INCHES	1335	Metres		270	360450
372	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003000900	NB 2.000 INCHES	2275	Metres		540	1228500
373	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001100	NB 3.000 INCHES	865	Metres		800	692000
374	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001300	NB 4.000 INCHES	970	Metres		1070	1037900
375	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001500	NB 6.000 INCHES	2465	Metres		1610	3968650
376	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001600	NB 8.000 INCHES	520	Metres		2140	1112800
377	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001700	NB 10.000 INCHES	80	Metres		2680	214400
378	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001800	NB 12.000 INCHES	2725	Metres		3210	8747250
379	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003001900	NB 14.000 INCHES	130	Metres		3750	487500
380	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002000	NB 16.000 INCHES	5300	Metres		4280	22684000
381	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002100	NB 18.000 INCHES	120	Metres		4820	578400
382	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002200	NB 20.000 INCHES	2705	Metres		5360	14498800
383	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002400	NB 24.000 INCHES	5930	Metres		6430	38129900
384	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002500	NB 26.000 INCHES	1885	Metres		6960	13119600
385	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002600	NB 28.000 INCHES	3885	Metres		7500	29137500
386	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003002800	NB 32.000 INCHES	50	Metres		8570	428500
387	A	B957-999-16-43-PK-SOR-9501-A-3M	M23003003200	NB 40.000 INCHES	1535	Metres		10710	16439850
388	A	B957-999-16-43-PK-SOR-9501-A-3M	M23400000000	SUPPLY OF STUDS ALONG WITH NUTS: Supply as per Technical Notes for Fasteners (6-44-0057) from Vendor enlisted in Project Master Supplier List of Studs along with two nuts for diameter < 1" and 3 nuts for diamemter >= 1"of nuts, as per the direction of Engineer in-charge. All Alloy steel fasteners used in SS Piping shall be Hot Dip Galvanized.					
389	A	B957-999-16-43-PK-SOR-9501-A-3M	M23401000000	AS FASTENERS (ASTM A193 GR.B7/B7M/A194 GR.2H/2HM)	0.13	Tonnes		241000	31330
390	A	B957-999-16-43-PK-SOR-9501-A-3M	M23402000000	AS FASTENERS (ASTM A193 GR.B16/A194 GR.7)	0.07	Tonnes		241000	16870
391	A	B957-999-16-43-PK-SOR-9501-A-3M	M23403000000	AS (IMPACT TESTED) FASTENERS (ASTM A320 GR.L7/A194 GR.7)	0.07	Tonnes		262400	18368
392	A	B957-999-16-43-PK-SOR-9501-A-3M	M23404000000	SS FASTENERS (ASTM A193 GR.B8/B8M/A194 GR.8/B8M)	0.07	Tonnes		482000	33740
393	A	B957-999-16-43-PK-SOR-9501-A-3M	M23405000000	SS (IMPACT TESTED) FASTENERS (ASTM A320 GR.B8CL.2/A194 GR.8)	0.07	Tonnes		482000	33740
394	A	B957-999-16-43-PK-SOR-9501-A-3M	M23406000000	SS (STRESS RUPTURE TESTED) FASTENERS (ASTM A453GR.660)	0.07	Tonnes		508800	35616
395	A	B957-999-16-43-PK-SOR-9501-A-3M	M23700000000	MODIFICATION/EXTRA WORKS (IF ANY) :- Cutting, bevelling, fitup, welding of different sizes of CS/AS/SS/Higher Alloy piping of all types and thicknessess in shop, in position, on ground/overhead on rack and at all elevations; transportation of pipes, fittings, flanges etc from owners storage point to work site/ work shop, making necessary scaffoldings, consumables, machinery, tools, tackles, labour and supervision including attending repairs for completing the work as per the instruction of Engineer-in-charge.					
396	A	B957-999-16-43-PK-SOR-9501-A-3M	M23701000000	FLAME CUTTING C.S PIPING IBR/NON IBR	6455	Inch Dia		250	1613750
397	A	B957-999-16-43-PK-SOR-9501-A-3M	M23702000000	HACKSAW CUTTING C.S PIPING IBR/NON IBR	2150	Inch Dia		270	580500
398	A	B957-999-16-43-PK-SOR-9501-A-3M	M23703000000	BEVELLING C.S PIPING IBR/NON IBR	8605	Inch Dia		290	2495450
399	A	B957-999-16-43-PK-SOR-9501-A-3M	M23704000000	FITUP & WELDING C.S PIPING IBR/NON IBR	8605	Inch Dia		700	6023500
400	A	B957-999-16-43-PK-SOR-9501-A-3M	M23705000000	FLAME CUTTING S.S PIPING IBR/NON IBR	450	Inch Dia		340	153000
401	A	B957-999-16-43-PK-SOR-9501-A-3M	M23706000000	HACKSAW CUTTING S.S PIPING IBR/NON IBR	150	Inch Dia		430	64500
402	A	B957-999-16-43-PK-SOR-9501-A-3M	M23707000000	BEVELLING S.S PIPING IBR/NON IBR	600	Inch Dia		440	264000
403	A	B957-999-16-43-PK-SOR-9501-A-3M	M23708000000	FITUP & WELDING S.S PIPING IBR/NON IBR	600	Inch Dia		1240	744000
404	A	B957-999-16-43-PK-SOR-9501-A-3M	M23709000000	FLAME CUTTING A.S PIPING IBR/NON IBR	5	Inch Dia		310	1550
405	A	B957-999-16-43-PK-SOR-9501-A-3M	M23710000000	HACKSAW CUTTING A.S PIPING IBR/NON IBR	5	Inch Dia		360	1800
406	A	B957-999-16-43-PK-SOR-9501-A-3M	M23711000000	BEVELLING A.S PIPING IBR/NON IBR	5	Inch Dia		410	2050
407	A	B957-999-16-43-PK-SOR-9501-A-3M	M23712000000	FITUP & WELDING A.S PIPING IBR/NON IBR	5	Inch Dia		1080	5400
408	A	B957-999-16-43-PK-SOR-9501-A-3M	M23713000000	FLAME CUTTING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		490	2450
409	A	B957-999-16-43-PK-SOR-9501-A-3M	M23714000000	HACKSAW CUTTING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		640	3200
410	A	B957-999-16-43-PK-SOR-9501-A-3M	M23715000000	BEVELLING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		660	3300
411	A	B957-999-16-43-PK-SOR-9501-A-3M	M23716000000	FITUP & WELDING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		4780	23900
412	A	B957-999-16-43-PK-SOR-9501-A-3M	M23717000000	FLAME CUTTING OF DUPLEX SS PIPING	5	Inch Dia		510	2550
413	A	B957-999-16-43-PK-SOR-9501-A-3M	M23718000000	HACKSAW CUTTING OF DUPLEX SS PIPING	5	Inch Dia		640	3200
414	A	B957-999-16-43-PK-SOR-9501-A-3M	M23719000000	BEVELLING OF DUPLEX SS PIPING	5	Inch Dia		660	3300
415	A	B957-999-16-43-PK-SOR-9501-A-3M	M23720000000	FITUP & WELDING OF DUPLEX SS PIPING	5	Inch Dia		1860	9300

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
416	A	B957-999-16-43-PK-SOR-9501-A-3M	M23800000000	REMOVAL ERECTED PIPING(ABOVE GROUND) :- Removal of piping existing/ erected including SW valves for modification as required as per Drawings/P and IDs/instructions of Engineer-in-charge at all elevations, including providing assistance to owner for draining, cleaning and purging of the lines to be removed , unbolting of flanged joints /cutting of pipe lines wherever required, installation of flanges and blind flanges, removal of insulation from insulated lines, removing supports, steam tracers, all fittings and flanges, instruments etc, cutting of pipes in appropriate length for transporting purposes, cleaning, flushing, drying and transporting all materials to storage point(within the complex battery limits) designated by Owner/EIL including stacking of material and disposing of waste etc as instructed by Engineer-in-charge.					
417	A	B957-999-16-43-PK-SOR-9501-A-3M	M23801000000	C.S/A.S PIPING	1950	Inch M		370	721500
418	A	B957-999-16-43-PK-SOR-9501-A-3M	M23802000000	S.S PIPING	1040	Inch M		650	676000
419	A	B957-999-16-43-PK-SOR-9501-A-3M	M23803000000	NICKEL/MONEL/INCOLOY PIPING	5	Inch M		1250	6250
420	A	B957-999-16-43-PK-SOR-9501-A-3M	M23804000000	DUPLEX SS PIPING	5	Inch M		990	4950
421	A	B957-999-16-43-PK-SOR-9501-A-3M	M24100000000	LOW FRICTION PADS: Supply, fabrication and fixing of low friction pads with suitable bonding materials / fasteners, as specified in Drawings / Isometrics / Special support sketches.					
422	A	B957-999-16-43-PK-SOR-9501-A-3M	M24101000000	TEFLON PAD WITH COMPRESSIVE STRENGTH (0.25 OFFSET) :1870 PSI	0.03	Cu. M		2635200	79056
423	A	B957-999-16-43-PK-SOR-9501-A-3M	M24102000000	GRAPHITE PAD WITH COMPRESSIVE STRENGTH : 2877 PSI	0.04	Cu. M		2371700	94868
424	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901000000	Digital Radiography: Performance of digital Radiographic inspection on Piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever elase even though not expressly mentioned but required to perform the work as per requirements of specification B957-000-6-42-WSP-0001 and instructions of Engineer in charge. Repeat Radiography due to defective radiograph on repaired joints due to contractor's fault and for additional radiography necessitated due to poor performance of contractor's welder shall be done at contractor's cost. Unit of radiography quantity is 'Nos. of circumferential weld joints'.					
425	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901100000	FOR JOINTS THK. <= 8MM (FOR CSD46:D79 OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
426	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901101000	NB 0.750 INCHES	2	Nos.		1050	2100
427	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901102000	NB 1.000 INCHES	1	Nos.		1050	1050
428	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901103000	NB 1.500 INCHES	1	Nos.		1570	1570
429	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901104000	NB 2.000 INCHES	55	Nos.		2100	115500
430	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901105000	NB 3.000 INCHES	108	Nos.		2220	239760
431	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901106000	NB 4.000 INCHES	108	Nos.		2960	319680
432	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901107000	NB 6.000 INCHES	120	Nos.		4430	531600
433	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901200000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
434	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901201000	NB 0.750 INCHES	2	Nos.		1050	2100
435	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901202000	NB 1.000 INCHES	2	Nos.		1050	2100
436	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901203000	NB 1.500 INCHES	1	Nos.		1570	1570
437	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901204000	NB 2.000 INCHES	10	Nos.		2100	21000
438	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901205000	NB 3.000 INCHES	48	Nos.		2220	106560
439	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901206000	NB 6.000 INCHES	2	Nos.		4430	8860
440	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901207000	NB 8.000 INCHES	1	Nos.		5910	5910
441	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901208000	NB 10.000 INCHES	3	Nos.		7390	22170
442	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901209000	NB 14.000 INCHES	10	Nos.		10350	103500
443	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901300000	FOR JOINTS ABOVE THK. 8MM					
444	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901301000	NB 0.750 INCHES	7	Nos.		1050	7350
445	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901302000	NB 1.000 INCHES	4	Nos.		1050	4200
446	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901303000	NB 2.000 INCHES	7	Nos.		2100	14700
447	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901304000	NB 3.000 INCHES	24	Nos.		2220	53280
448	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901305000	NB 4.000 INCHES	72	Nos.		2960	213120
449	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901306000	NB 6.000 INCHES	52	Nos.		4430	230360
450	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901307000	NB 8.000 INCHES	117	Nos.		5910	691470
451	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901308000	NB 10.000 INCHES	53	Nos.		7390	391670
452	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901309000	NB 12.000 INCHES	50	Nos.		8870	443500
453	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901310000	NB 14.000 INCHES	1	Nos.		10350	10350
454	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901311000	NB 16.000 INCHES	1	Nos.		11830	11830
455	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901312000	NB 18.000 INCHES	20	Nos.		13300	266000
456	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901313000	NB 20.000 INCHES	9	Nos.		14780	133020
457	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901314000	NB 24.000 INCHES	160	Nos.		17740	2838400
458	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901315000	NB 26.000 INCHES	7	Nos.		19220	134540
459	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901316000	NB 28.000 INCHES	25	Nos.		20700	517500
460	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901317000	NB 30.000 INCHES	1	NOs		22170	22170
461	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901318000	NB 32.000 INCHES	3	Nos.		23650	70950

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
462	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901319000	NB 36.000 INCHES	8	Nos.		26610	212880
463	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901320000	NB 40.000 INCHES	1	Nos.		29570	29570
464	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901321000	NB 56.000 INCHES	3	Nos.		41390	124170
465	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901322000	NB 60.000 INCHES	9	Nos.		44350	399150
466	A	B957-999-16-43-PK-SOR-9501-A-3M	M29901323000	NB 94.000 INCHES	6	Nos.		69480	416880
467	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905000000	CLOSE PROXIMITY RADIOGRAPHY WITH "RADIOGRAPHY WITH SELENIUM-75 SOURCE USING SAFE RADIATION TECHNIQUE":- Performance of radiographic inspection on piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge by using "SELENIUM-75" source based radiography system. Radiographs shall be submitted to the Engineer in-charge. Repeat Radiography due to defective radiograph on repaired joints due to Contractor's fault and for additional radiography necessitated due to poor performance of contractor's welders shall be done at contractor's cost. Note: Unit for radiography quantity is "Nos of circumferential weld joints", and rates are also inclusive of scaffoldings wherever required radiography system. Radiographs shall be submitted to the Engineer in-charge.					
468	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905100000	FOR JOINTS THK. <= 8MM (FOR CSD46:D79 OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
469	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905101000	NB 0.750 INCHES	1	Nos.		620	620
470	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905102000	NB 1.000 INCHES	1	Nos.		620	620
471	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905103000	NB 1.500 INCHES	1	Nos.		930	930
472	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905104000	NB 2.000 INCHES	14	Nos.		1240	17360
473	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905105000	NB 3.000 INCHES	28	Nos.		1860	52080
474	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905106000	NB 4.000 INCHES	28	Nos.		2490	69720
475	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905107000	NB 6.000 INCHES	31	Nos.		2890	89590
476	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905200000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
477	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905201000	NB 0.750 INCHES	1	Nos.		620	620
478	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905202000	NB 1.000 INCHES	1	Nos.		620	620
479	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905203000	NB 1.500 INCHES	1	Nos.		930	930
480	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905204000	NB 2.000 INCHES	3	Nos.		1240	3720
481	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905205000	NB 3.000 INCHES	12	Nos.		1860	22320
482	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905206000	NB 6.000 INCHES	1	Nos.		2890	2890
483	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905207000	NB 8.000 INCHES	1	Nos.		3860	3860
484	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905208000	NB 10.000 INCHES	1	Nos.		4820	4820
485	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905209000	NB 14.000 INCHES	3	Nos.		6750	20250
486	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905300000	FOR JOINTS ABOVE THK. 8MM					
487	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905301000	NB 0.750 INCHES	2	Nos.		620	1240
488	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905302000	NB 1.000 INCHES	1	Nos.		620	620
489	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905303000	NB 2.000 INCHES	2	Nos.		1240	2480
490	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905304000	NB 3.000 INCHES	7	Nos.		1860	13020
491	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905305000	NB 4.000 INCHES	19	Nos.		2490	47310
492	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905306000	NB 6.000 INCHES	13	Nos.		2890	37570
493	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905307000	NB 8.000 INCHES	30	Nos.		3860	115800
494	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905308000	NB 10.000 INCHES	13	Nos.		4820	62660
495	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905309000	NB 12.000 INCHES	13	Nos.		5780	75140
496	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905310000	NB 14.000 INCHES	3	Nos.		6750	20250
497	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905311000	NB 16.000 INCHES	3	Nos.		7710	23130
498	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905312000	NB 18.000 INCHES	6	Nos.		8680	52080
499	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905313000	NB 20.000 INCHES	2	Nos.		9640	19280
500	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905314000	NB 24.000 INCHES	41	Nos.		11570	474370
501	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905315000	NB 26.000 INCHES	2	Nos.		12530	25060
502	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905316000	NB 28.000 INCHES	7	Nos.		13500	94500
503	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905317000	NB 30.000 INCHES	1	NOs		14460	14460
504	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905318000	NB 32.000 INCHES	1	Nos.		15430	15430
505	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905319000	NB 36.000 INCHES	2	Nos.		15910	31820
506	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905320000	NB 40.000 INCHES	1	Nos.		19280	19280
507	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905321000	NB 56.000 INCHES	1	Nos.		26990	26990
508	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905322000	NB 60.000 INCHES	2	Nos.		28920	57840
509	A	B957-999-16-43-PK-SOR-9501-A-3M	M29905323000	NB 94.000 INCHES	2	Nos.		45310	90620

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
510	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906000000	External cleaning of SS welds as per specification:B957-000-06-42-CCS-011. includng supply of spares, laboratory facilities, with all accessories for conducting test, chemicals, safety accessories and also providing or hiring all necessary equipment and whatever else even though not expressly mentioned herein and in specificaions but required to perform the work as per job specifications and instructions of Engineer-in-Charge. (Unit of Measurement is No. of joints.)					
511	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906001000	NB 0.50 INCHES	4	Nos.		70	280
512	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906002000	NB 0.750 INCHES	55	Nos.		70	3850
513	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906003000	NB 1.000 INCHES	55	Nos.		70	3850
514	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906004000	NB 1.500 INCHES	17	Nos.		120	2040
515	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906005000	NB 2.000 INCHES	55	Nos.		160	8800
516	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906006000	NB 3.000 INCHES	55	Nos.		240	13200
517	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906007000	NB 4.000 INCHES	55	Nos.		310	17050
518	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906008000	NB 6.000 INCHES	55	Nos.		470	25850
519	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906009000	NB 8.000 INCHES	55	Nos.		620	34100
520	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906010000	NB 10.000 INCHES	55	Nos.		780	42900
521	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906011000	NB 12.000 INCHES	55	Nos.		940	51700
522	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906012000	NB 14.000 INCHES	55	Nos.		1090	59950
523	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906013000	NB 16.000 INCHES	1	Nos.		1200	1200
524	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906014000	NB 18.000 INCHES	1	Nos.		1350	1350
525	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906015000	NB 20.000 INCHES	1	Nos.		1500	1500
526	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906016000	NB 24.000 INCHES	1	Nos.		1800	1800
527	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906017000	NB 28.000 INCHES	28	Nos.		2100	58800
528	A	B957-999-16-43-PK-SOR-9501-A-3M	M29906018000	NB 30.000 INCHES	28	Nos.		2250	63000
529	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907000000	HOT TAPPING WORKS: The Hook Ups shall be carried out, as per the requirement of Client/Engineer in Charge with the fluid on stream inside the existing line (HOT TAPPING). All the activities described in SOR item and relevant sections of Piping Scope of work shall be in addition to this SOR item. Removal of painting with wire brush and cleaning the spot of hot tapping and offer for inspection. After inspection clearance, weld a "shop hydrotested stub" of specified dia and length as per the specification to the main line.After the clearance of hydro test, welding of RF Pad on the stub /main line and carry out leak test at a pressure of 1.25 kg/cm2. The stub has to be pre-fabricated before taking hot tapping as per specification and instruction of Engineer in charge. Installation of a valve on the stub welded on the main line. The valve is required to be hydro-tested in the shop prior to field erection. Completion of Hot-Tapping work including supply and arranging of hot Tapping machine, cutter, Split Tee (if required) and also taking out the cut piece of pipe shall be under the scope of contractor. Installation of a blind flange on the open end of valves, if required, after removal of hot tapping machine shall be by contractor. All materials (excluding split Tee) for hookup like RF pad, stub in pipe, valves, flanges, gaskets, stub, nuts, blind flanges, etc. to be supplied by the Owner. Split-Tee shall be supplied by the Contractor. Notes: 1)The rate given in the SOR for hot tapping shall be inclusive of pre-fabrication and installation of stub to the header and its hydro-test, fabrication and welding of RF Pad and its air test including supply of compressor for air test, lug grinding (if required)/supply and welding of Split-Tee and installation of valve on the welded stub, fabrication and installation of blind flange on open end of the valve after the completion of the hot tapping works and removal of hot tapping machine supplied by contractor, transportation of equipment, materials, etc. and all other items required but not limited to mentioned for completion of the work. 2) The rate is inclusive of scaffolding /barricading as required for carrying out hot tapping at all elevations. The Scaffolding has to be erected in such a way that two separate and independent access will be available for the temporary platforms at all elevations erected for Hot Tapping. The Contractor shall supply, fabricate and erect all the structural members and arrangements required for providing: a) support to the existing line/main line on to which the Hot Tapping is made b) working platform for Hot Tapping personnel c) Access to Hot Tapping platform where Hot Tapping personnel are deployed					
530	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907010000	NB 2.0 INCH - 6.0 INCH	1	Nos.		389920	389920
531	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907020000	NB 8.0 INCH - 14.0 INCH	1	Nos.		746630	746630
532	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907030000	NB 16.0 INCH - 24.0 INCH	1	Nos.		1707490	1707490
533	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907040000	NB 26.0 INCH - 36.0 INCH	1	Nos.		3726700	3726700
534	A	B957-999-16-43-PK-SOR-9501-A-3M	M29907050000	ABOVE 36.0 INCH	1	Nos.		3744920	3744920
535	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908050000	CHEMICAL CLEANING/PICKLING :- Cleaning and pickling of equipment/pipeline includng preparation of circulation loop, supply of temporary piping, pumps, heater coils, gaskets, thermometer, hydrometer, valve, test coupon, spares, laboratory facilities, with all accessories for conducting test, chemicals, safety accessories and also providing or hiring all necessary equipment and whatever else even though not expressly mentioned herein and in specificaions but required to perform the workas per specifications and instructions of Engineer-in-Charge.					
536	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908051000	CHEMICAL CLEANING OF VHP / HP STEAM PIPING					
537	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908052000	NB 0.750 INCHES	25	Metres		290	7250
538	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908053000	NB 1.500 INCHES	15	Metres		440	6600
539	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908054000	NB 2.000 INCHES	25	Metres		580	14500

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
540	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908055000	NB 3.000 INCHES	20	Metres		870	17400
541	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908056000	NB 4.000 INCHES	35	Metres		1160	40600
542	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908057000	NB 6.000 INCHES	135	Metres		1740	234900
543	A	B957-999-16-43-PK-SOR-9501-A-3M	M29908058000	NB 8.000 INCHES	25	Metres		2310	57750
544	A	B957-999-16-43-PK-SOR-9501-A-3M	M40000000000	PAINTING (OFFSITES) :- Supply of paints and primers, preparation of surfaces and application of primer and finish paints, identification (Line numbering), lettering, colour bands, colour coding etc. as specified including rubdown and touch up of shop primer wherever required, providing scaffolding for all heights, labour, material, tools and tackles, consumables supervision etc. to complete the work in all respects as per EIL painting spec., drawings and direction of Engineer-in-Charge for all types of uninsulated piping and insulated piping as specified including all pipes, fittings, flanges, supports, valves etc. Surface preparation by blast cleaning and application of first coat of primer (inorganic zinc silicate, F9) shall be done in fabrication yard prior to erection. For insulated piping wherever blast cleaning with no primer application is specified, in such cases finish paints shall also be applied in the fabrication yard. The identification marks of the piping and joints shall be noted before blasting and the same shall be transferred on primed surface with Polyurethane paint (F2) or as per the instructions of Engineer-in-Charge. Notes: 1. All joints (fabrication as well as erection joints) shall be left unpainted till hydrotesting. 2. No extra payment shall be made for identification (line numbering etc.) of insulated and uninsulated lines.					
545	A	B957-999-16-43-PK-SOR-9501-A-3M	M49100000000	PAINTING OF UNINSULATED PIPING FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 5 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR CS/LTCS/AS.					
546	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101000000	DESIGN TEMP GROUP: -45 TO -15(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat, Intermediate Coat: None, Finish Coat: None, Total Final DFT in Microns (min.): 65-75 mu.					
547	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101010000	PIPES					
548	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101010500	NB: .75 Inches	5	Metres		40	200
549	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101010600	NB: 1 Inches	35	Metres		50	1750
550	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101010900	NB: 2 Inches	5	Metres		90	450
551	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101011100	NB: 3 Inches	10	Metres		130	1300
552	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101011300	NB: 4 Inches	80	Metres		160	12800
553	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101011500	NB: 6 Inches	30	Metres		240	7200
554	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101012100	NB: 18 Inches	225	Metres		650	146250
555	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101012400	NB: 24 Inches	310	Metres		860	266600
556	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101012800	NB: 32 Inches	630	Metres		1150	724500
557	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101013000	NB: 36 Inches	1895	Metres		1290	2444550
558	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101013200	NB: 40 Inches	25	Metres		1430	35750
559	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101014000	NB: 56 Inches	450	Metres		2010	904500
560	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101014200	NB: 60 Inches	5	Metres		2150	10750
561	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101020000	VALVES					
562	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101021100	NB: 3 Inches	2	Nos.		190	380
563	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101021300	NB: 4 Inches	5	Nos.		240	1200
564	A	B957-999-16-43-PK-SOR-9501-A-3M	M49101021500	NB: 6 Inches	5	Nos.		360	1800
565	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102000000	DESIGN TEMP GROUP: -14 TO 80(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat + 1 coat of P-6 @ 40 mu DFT/ coat, Intermediate Coat: 1 coat of F-6B @ 100 mu DFT/coat, Finish Coat: 1 coat of F-2 @ 40 mu DFT/coat, Total Final DFT in Microns (min.): 245-255 mu.					
566	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010000	PIPES					
567	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010400	NB: .5 Inches	10	Metres		60	600
568	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010500	NB: .75 Inches	240	Metres		80	19200
569	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010600	NB: 1 Inches	340	Metres		100	34000
570	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010800	NB: 1.5 Inches	75	Metres		140	10500
571	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102010900	NB: 2 Inches	7330	Metres		180	1319400
572	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011100	NB: 3 Inches	19115	Metres		260	4969900
573	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011300	NB: 4 Inches	22710	Metres		340	7721400
574	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011500	NB: 6 Inches	19550	Metres		500	9775000
575	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011600	NB: 8 Inches	14990	Metres		650	9743500
576	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011700	NB: 10 Inches	4900	Metres		810	3969000
577	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011800	NB: 12 Inches	7370	Metres		970	7148900
578	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102011900	NB: 14 Inches	2715	Metres		1060	2877900
579	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012000	NB: 16 Inches	3970	Metres		1210	4803700
580	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012100	NB: 18 Inches	1045	Metres		1360	1421200
581	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012200	NB: 20 Inches	6470	Metres		1510	9769700
582	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012400	NB: 24 Inches	3750	Metres		1820	6825000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
583	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012500	NB: 26 Inches	1410	Metres		1970	2777700
584	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012600	NB: 28 Inches	1550	Metres		2120	3286000
585	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102012700	NB: 30 Inches	3975	Metres		2270	9023250
586	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102013200	NB: 40 Inches	1495	Metres		3030	4529850
587	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102013600	NB: 48 Inches	10	Metres		3630	36300
588	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102014000	NB: 56 Inches	385	Metres		4240	1632400
589	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102014200	NB: 60 Inches	2115	Metres		4540	9602100
590	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102020000	VALVES					
591	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102020900	NB: 2 Inches	101	Nos.		270	27270
592	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021100	NB: 3 Inches	122	Nos.		400	48800
593	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021300	NB: 4 Inches	91	Nos.		510	46410
594	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021500	NB: 6 Inches	76	Nos.		750	57000
595	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021600	NB: 8 Inches	39	Nos.		980	38220
596	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021700	NB: 10 Inches	9	Nos.		1220	10980
597	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102021800	NB: 12 Inches	22	Nos.		1450	31900
598	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102022100	NB: 18 Inches	7	Nos.		2040	14280
599	A	B957-999-16-43-PK-SOR-9501-A-3M	M49102022200	NB: 20 Inches	2	Nos.		2270	4540
600	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103000000	DESIGN TEMP GROUP: 81 TO 250(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat + 1 coats of F-11 @ 20 mu DFT/coat, Intermediate Coat: None, Finish Coat: 1 coats of F- 11 @ 20 mu DFT/coat, Total Final DFT in Microns (min.): 105-115 mu.					
601	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103010000	PIPES					
602	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103010500	NB: .75 Inches	5	Metres		60	300
603	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103010600	NB: 1 Inches	20	Metres		80	1600
604	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103010900	NB: 2 Inches	995	Metres		150	149250
605	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103011100	NB: 3 Inches	2080	Metres		220	457600
606	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103011300	NB: 4 Inches	6285	Metres		280	1759800
607	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103011500	NB: 6 Inches	2325	Metres		410	953250
608	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103011600	NB: 8 Inches	7090	Metres		530	3757700
609	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103011700	NB: 10 Inches	515	Metres		660	339900
610	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103012000	NB: 16 Inches	1550	Metres		980	1519000
611	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103012800	NB: 32 Inches	60	Metres		1970	118200
612	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103014000	NB: 56 Inches	115	Metres		3440	395600
613	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103014800	NB: 72 Inches	5	Metres		4420	22100
614	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103015900	NB: 94 Inches	1510	Metres		5770	8712700
615	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103020000	VALVES					
616	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103020900	NB: 2 Inches	8	Nos.		220	1760
617	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103021300	NB: 4 Inches	5	Nos.		410	2050
618	A	B957-999-16-43-PK-SOR-9501-A-3M	M49103021600	NB: 8 Inches	5	Nos.		790	3950
619	A	B957-999-16-43-PK-SOR-9501-A-3M	M49200000000	PAINTING OF INSULATED PIPING OF CS & AS FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 11 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR CS/LTCS/AS.					
620	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201000000	DESIGN TEMP GROUP: -45 TO 125(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-10; 1coat of F-15 @ 100 mu DFT/coat, Primer: None, Finish paint: 2 coats of F-15 @ 100 mu DFT/coat, Total DFT 300 mu.					
621	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010000	PIPES					
622	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010400	NB: .5 Inches	5	Metres		60	300
623	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010500	NB: .75 Inches	65	Metres		70	4550
624	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010600	NB: 1 Inches	65	Metres		90	5850
625	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010800	NB: 1.5 Inches	35	Metres		130	4550
626	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201010900	NB: 2 Inches	175	Metres		160	28000
627	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011100	NB: 3 Inches	390	Metres		240	93600
628	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011300	NB: 4 Inches	1450	Metres		310	449500
629	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011500	NB: 6 Inches	5980	Metres		450	2691000
630	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011600	NB: 8 Inches	5175	Metres		590	3053250
631	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011700	NB: 10 Inches	6350	Metres		730	4635500
632	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011800	NB: 12 Inches	855	Metres		870	743850
633	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201011900	NB: 14 Inches	70	Metres		950	66500
634	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201012000	NB: 16 Inches	390	Metres		1090	425100

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
635	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201012100	NB: 18 Inches	10	Metres		1220	12200
636	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201012400	NB: 24 Inches	810	Metres		1630	1320300
637	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201020000	VALVES					
638	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201020900	NB: 2 Inches	14	Nos.		240	3360
639	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021100	NB: 3 Inches	7	Nos.		360	2520
640	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021300	NB: 4 Inches	22	Nos.		460	10120
641	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021500	NB: 6 Inches	30	Nos.		680	20400
642	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021600	NB: 8 Inches	9	Nos.		880	7920
643	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021800	NB: 12 Inches	2	Nos.		1300	2600
644	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201021900	NB: 14 Inches	2	Nos.		1430	2860
645	A	B957-999-16-43-PK-SOR-9501-A-3M	M49201022100	NB: 18 Inches	2	Nos.		1840	3680
646	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202000000	DESIGN TEMP GROUP: 126 TO 560(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-10; 1 coat of F-16 @ 125 mu DFT/coat, Primer: None, Finish paint: 1 coat F-16 @ 125 mu DFT/coat, Total DFT: 250 mu.					
647	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010000	PIPES					
648	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010400	NB: .5 Inches	5	Metres		80	400
649	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010500	NB: .75 Inches	20	Metres		100	2000
650	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010600	NB: 1 Inches	20	Metres		130	2600
651	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010800	NB: 1.5 Inches	5	Metres		180	900
652	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202010900	NB: 2 Inches	2415	Metres		230	555450
653	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011100	NB: 3 Inches	830	Metres		330	273900
654	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011300	NB: 4 Inches	835	Metres		430	359050
655	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011500	NB: 6 Inches	4210	Metres		630	2652300
656	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011600	NB: 8 Inches	4585	Metres		820	3759700
657	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011700	NB: 10 Inches	385	Metres		1030	396550
658	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011800	NB: 12 Inches	220	Metres		1220	268400
659	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202011900	NB: 14 Inches	305	Metres		1340	408700
660	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012000	NB: 16 Inches	375	Metres		1530	573750
661	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012100	NB: 18 Inches	1045	Metres		1720	1797400
662	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012200	NB: 20 Inches	45	Metres		1910	85950
663	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012400	NB: 24 Inches	6110	Metres		2290	13991900
664	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012500	NB: 26 Inches	425	Metres		2480	1054000
665	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012600	NB: 28 Inches	2085	Metres		2670	5566950
666	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202012800	NB: 32 Inches	115	Metres		3060	351900
667	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202013000	NB: 36 Inches	115	Metres		3440	395600
668	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202014000	NB: 56 Inches	115	Metres		5350	615250
669	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202014200	NB: 60 Inches	175	Metres		5730	1002750
670	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202020000	VALVES					
671	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202020900	NB: 2 Inches	28	Nos.		340	9520
672	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202021100	NB: 3 Inches	30	Nos.		500	15000
673	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202021300	NB: 4 Inches	5	Nos.		640	3200
674	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202021500	NB: 6 Inches	6	Nos.		950	5700
675	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202021600	NB: 8 Inches	2	Nos.		1240	2480
676	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202021800	NB: 12 Inches	3	Nos.		1830	5490
677	A	B957-999-16-43-PK-SOR-9501-A-3M	M49202022400	NB: 24 Inches	2	Nos.		3440	6880
678	A	B957-999-16-43-PK-SOR-9501-A-3M	M49300000000	PAINTING OF INSULATED PIPING OF SS & MS FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 11 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR SS/MS.					
679	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301000000	DESIGN TEMP GROUP: -45 TO 125(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-16; (15-25 mu surface profile) 1 coat of F-15 @100 mu DFT/coat, Primer: None, Finish paint: 2 coats of F-15 @ 100 mu DFT/coat, Total DFT: 300 mu.					
680	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010000	PIPES					
681	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010400	NB: .5 Inches	5	Metres		60	300
682	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010500	NB: .75 Inches	5	Metres		70	350
683	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010600	NB: 1 Inches	80	Metres		90	7200
684	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010800	NB: 1.5 Inches	5	Metres		130	650
685	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301010900	NB: 2 Inches	95	Metres		160	15200
686	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301011100	NB: 3 Inches	5	Metres		240	1200
687	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301011300	NB: 4 Inches	5	Metres		310	1550

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
688	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301011500	NB: 6 Inches	1925	Metres		450	866250
689	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301011600	NB: 8 Inches	825	Metres		590	486750
690	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301020000	VALVES					
691	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301020900	NB: 2 Inches	3	Nos.		240	720
692	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301021100	NB: 3 Inches	2	Nos.		360	720
693	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301021500	NB: 6 Inches	12	Nos.		680	8160
694	A	B957-999-16-43-PK-SOR-9501-A-3M	M49301021600	NB: 8 Inches	1	Nos.		880	880
695	A	B957-999-16-43-PK-SOR-9501-A-3M	M5**********	********** LEGENDS / NOTES FOR INSULATION WORKS ********** ** Types of Insulation : IH = Insulation for Heat Conservation IT = Insulation for Steam Traced Lines IS = Insulation for Personal Safety IC = Cold Insulation for Anti-condensation IE = Insulation for Electrically Traced Lines IJ = Insulation for Jacketed Lines IK = Insulation for Dual Insulated Lines ** Basic Line Surface Materials : CS = Carbon Steel (Including LT Carbon Steel) AS = Alloy Steel SS = Stainless Steel ** Notes : 1. For insulation type IT,tracer size and tracer numbers shall be as per specification. 2. Insulation thickness for IC where insulation material is Poly Urethane foam (PUF) / Poly Isocyanurate (PIC) + Cellular Glass includes outer layer of 50mm of Cellular Glass and Inner layer of balance thickness of PUF/PIC 3. Insulation for IE consists of inner layer of Rockwool and outer layer of PUF / PIC. The thicknesses have been specified as THK(I) and THK(O) for inner and outer layers respectively. **********					
696	A	B957-999-16-43-PK-SOR-9501-A-3M	M60000000000	HOT INSULATION (OFFSITES): Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party(LIyods/BV/DNV or any other Client approved party)at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with sheet cladding as per spec. , providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
697	A	B957-999-16-43-PK-SOR-9501-A-3M	M60100000000	INSULATION MATERIAL : ROCKWOOL					
698	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL					
699	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010000	PIPES					
700	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010405	NB 00.50 INCHES; THICKNESS 25 MM	10	Metres		1430	14300
701	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010505	NB 00.75 INCHES; THICKNESS 25 MM	35	Metres		1540	53900
702	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010508	NB 00.75 INCHES; THICKNESS 40 MM	10	Metres		2190	21900
703	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010605	NB 01.00 INCHES; THICKNESS 25 MM	10	Metres		1670	16700
704	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010805	NB 01.50 INCHES; THICKNESS 25 MM	10	Metres		1990	19900
705	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010808	NB 01.50 INCHES; THICKNESS 40 MM	10	Metres		2660	26600
706	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010905	NB 02.00 INCHES; THICKNESS 25 MM	2185	Metres		2230	4872550
707	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101010908	NB 02.00 INCHES; THICKNESS 40 MM	225	Metres		2930	659250
708	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011105	NB 03.00 INCHES; THICKNESS 25 MM	215	Metres		2830	608450
709	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011108	NB 03.00 INCHES; THICKNESS 40 MM	2185	Metres		3540	7734900
710	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011305	NB 04.00 INCHES; THICKNESS 25 MM	3585	Metres		3350	12009750
711	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011308	NB 04.00 INCHES; THICKNESS 40 MM	10	Metres		4090	40900
712	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011505	NB 06.00 INCHES; THICKNESS 25 MM	1980	Metres		4470	8850600
713	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011605	NB 08.00 INCHES; THICKNESS 25 MM	1875	Metres		5520	10350000
714	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011610	NB 08.00 INCHES; THICKNESS 50 MM	590	Metres		6960	4106400
715	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011705	NB 10.00 INCHES; THICKNESS 25 MM	1395	Metres		6630	9248850
716	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011710	NB 10.00 INCHES; THICKNESS 50 MM	10	Metres		8160	81600
717	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011805	NB 12.00 INCHES; THICKNESS 25 MM	105	Metres		7690	807450
718	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011810	NB 12.00 INCHES; THICKNESS 50 MM	60	Metres		9300	558000
719	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011905	NB 14.00 INCHES; THICKNESS 25 MM	65	Metres		8350	542750
720	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101011910	NB 14.00 INCHES; THICKNESS 50 MM	300	Metres		10010	3003000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
721	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101012010	NB 16.00 INCHES; THICKNESS 50 MM	255	Metres		11150	2843250
722	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101012105	NB 18.00 INCHES; THICKNESS 25 MM	15	Metres		10450	156750
723	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101012110	NB 18.00 INCHES; THICKNESS 50 MM	300	Metres		12280	3684000
724	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101012410	NB 24.00 INCHES; THICKNESS 50 MM	1205	Metres		15700	18918500
725	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101012610	NB 28.00 INCHES; THICKNESS 50 MM	2015	Metres		17980	36229700
726	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101020000	FLANGE ASSEMBLIES					
727	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101020805	NB 01.50 INCHES; THICKNESS 25 MM	1	NOs		1990	1990
728	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101020808	NB 01.50 INCHES; THICKNESS 40 MM	1	NOs		2660	2660
729	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101021605	NB 08.00 INCHES; THICKNESS 25 MM	1	NOs		5520	5520
730	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101022410	NB 24.00 INCHES; THICKNESS 50 MM	1	NOs		15700	15700
731	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101030000	BLIND FLANGE ASSEMBLIES					
732	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101030505	NB 00.75 INCHES; THICKNESS 25 MM	1	NOs		1540	1540
733	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101030908	NB 02.00 INCHES; THICKNESS 40 MM	2	NOs		2930	5860
734	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101031108	NB 03.00 INCHES; THICKNESS 40 MM	6	NOs		3540	21240
735	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101031308	NB 04.00 INCHES; THICKNESS 40 MM	5	NOs		4090	20450
736	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101031610	NB 08.00 INCHES; THICKNESS 50 MM	3	NOs		6960	20880
737	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101031710	NB 10.00 INCHES; THICKNESS 50 MM	5	NOs		8160	40800
738	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101031810	NB 12.00 INCHES; THICKNESS 50 MM	78	NOs		9300	725400
739	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040000	VALVE ASSEMBLIES					
740	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040405	NB 00.50 INCHES; THICKNESS 25 MM	2	NOs		2860	5720
741	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040505	NB 00.75 INCHES; THICKNESS 25 MM	10	NOs		3070	30700
742	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040508	NB 00.75 INCHES; THICKNESS 40 MM	1	NOs		4380	4380
743	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040905	NB 02.00 INCHES; THICKNESS 25 MM	1	NOs		4460	4460
744	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101040908	NB 02.00 INCHES; THICKNESS 40 MM	6	NOs		5850	35100
745	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101041805	NB 12.00 INCHES; THICKNESS 25 MM	2	NOs		15380	30760
746	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101041905	NB 14.00 INCHES; THICKNESS 25 MM	2	NOs		16690	33380
747	A	B957-999-16-43-PK-SOR-9501-A-3M	M60101042105	NB 18.00 INCHES; THICKNESS 25 MM	2	NOs		20900	41800
748	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 176 (DEG C) TO 350 (DEG C); INSULATION MATERIAL : ROCKWOOL					
749	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010000	PIPES					
750	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010508	NB 00.75 INCHES; THICKNESS 40 MM	30	Metres		1680	50400
751	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010608	NB 01.00 INCHES; THICKNESS 40 MM	10	Metres		1790	17900
752	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010610	NB 01.00 INCHES; THICKNESS 50 MM	35	Metres		2160	75600
753	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010613	NB 01.00 INCHES; THICKNESS 65 MM	10	Metres		2730	27300
754	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010908	NB 02.00 INCHES; THICKNESS 40 MM	10	Metres		2250	22500
755	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010910	NB 02.00 INCHES; THICKNESS 50 MM	145	Metres		2630	381350
756	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102010913	NB 02.00 INCHES; THICKNESS 65 MM	10	Metres		3230	32300
757	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011313	NB 04.00 INCHES; THICKNESS 65 MM	60	Metres		4240	254400
758	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011513	NB 06.00 INCHES; THICKNESS 65 MM	395	Metres		5240	2069800
759	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011518	NB 06.00 INCHES; THICKNESS 90 MM	10	Metres		6490	64900
760	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011615	NB 08.00 INCHES; THICKNESS 75 MM	300	Metres		6710	2013000
761	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011715	NB 10.00 INCHES; THICKNESS 75 MM	340	Metres		7750	2635000
762	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011810	NB 12.00 INCHES; THICKNESS 50 MM	10	Metres		7280	72800
763	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102011815	NB 12.00 INCHES; THICKNESS 75 MM	25	Metres		8740	218500
764	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102012215	NB 20.00 INCHES; THICKNESS 75 MM	55	Metres		12290	675950
765	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102012410	NB 24.00 INCHES; THICKNESS 50 MM	55	Metres		12310	677050
766	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102012415	NB 24.00 INCHES; THICKNESS 75 MM	2455	Metres		14250	34983750
767	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102012515	NB 26.00 INCHES; THICKNESS 75 MM	490	Metres		15240	7467600
768	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102020000	FLANGE ASSEMBLIES					
769	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102020613	NB 01.00 INCHES; THICKNESS 65 MM	1	NOs		2730	2730
770	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102020908	NB 02.00 INCHES; THICKNESS 40 MM	1	NOs		2250	2250
771	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102020913	NB 02.00 INCHES; THICKNESS 65 MM	1	NOs		3230	3230
772	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102021715	NB 10.00 INCHES; THICKNESS 75 MM	2	NOs		7750	15500
773	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102022215	NB 20.00 INCHES; THICKNESS 75 MM	1	NOs		12290	12290
774	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102022410	NB 24.00 INCHES; THICKNESS 50 MM	2	NOs		12310	24620
775	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102030000	BLIND FLANGE ASSEMBLIES					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
776	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102030610	NB 01.00 INCHES; THICKNESS 50 MM	3	NOs		2160	6480
777	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102030910	NB 02.00 INCHES; THICKNESS 50 MM	3	NOs		2630	7890
778	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102031313	NB 04.00 INCHES; THICKNESS 65 MM	13	NOs		4240	55120
779	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102031513	NB 06.00 INCHES; THICKNESS 65 MM	5	NOs		5240	26200
780	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102031810	NB 12.00 INCHES; THICKNESS 50 MM	3	NOs		7280	21840
781	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102031815	NB 12.00 INCHES; THICKNESS 75 MM	77	NOs		8740	672980
782	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102032515	NB 26.00 INCHES; THICKNESS 75 MM	1	NOs		15240	15240
783	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040000	VALVE ASSEMBLIES					
784	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040508	NB 00.75 INCHES; THICKNESS 40 MM	5	NOs		3370	16850
785	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040608	NB 01.00 INCHES; THICKNESS 40 MM	3	NOs		3580	10740
786	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040610	NB 01.00 INCHES; THICKNESS 50 MM	8	NOs		4320	34560
787	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040613	NB 01.00 INCHES; THICKNESS 65 MM	2	NOs		5460	10920
788	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040908	NB 02.00 INCHES; THICKNESS 40 MM	2	NOs		4500	9000
789	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102040913	NB 02.00 INCHES; THICKNESS 65 MM	2	NOs		6460	12920
790	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102041715	NB 10.00 INCHES; THICKNESS 75 MM	2	NOs		15500	31000
791	A	B957-999-16-43-PK-SOR-9501-A-3M	M60102042410	NB 24.00 INCHES; THICKNESS 50 MM	2	NOs		28490	56980
792	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : ROCKWOOL					
793	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103010000	PIPES					
794	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103010615	NB 01.00 INCHES; THICKNESS 75 MM	10	Metres		3120	31200
795	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103010618	NB 01.00 INCHES; THICKNESS 90 MM	10	Metres		3750	37500
796	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103010918	NB 02.00 INCHES; THICKNESS 90 MM	10	Metres		4290	42900
797	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103010923	NB 02.00 INCHES; THICKNESS 115 MM	15	Metres		5440	81600
798	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011318	NB 04.00 INCHES; THICKNESS 90 MM	15	Metres		5390	80850
799	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011520	NB 06.00 INCHES; THICKNESS 100 MM	325	Metres		7010	2278250
800	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011528	NB 06.00 INCHES; THICKNESS 140 MM	10	Metres		9230	92300
801	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011620	NB 08.00 INCHES; THICKNESS 100 MM	1955	Metres		8070	15776850
802	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011723	NB 10.00 INCHES; THICKNESS 115 MM	10	Metres		10130	101300
803	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011823	NB 12.00 INCHES; THICKNESS 115 MM	50	Metres		11240	562000
804	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103011830	NB 12.00 INCHES; THICKNESS 150 MM	100	Metres		13610	1361000
805	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103012023	NB 16.00 INCHES; THICKNESS 115 MM	135	Metres		13050	1761750
806	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103012123	NB 18.00 INCHES; THICKNESS 115 MM	825	Metres		14180	11698500
807	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103012433	NB 24.00 INCHES; THICKNESS 165 MM	985	Metres		21940	21610900
808	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103020000	FLANGE ASSEMBLIES					
809	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103020918	NB 02.00 INCHES; THICKNESS 90 MM	1	NOs		4290	4290
810	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103021620	NB 08.00 INCHES; THICKNESS 100 MM	2	NOs		8070	16140
811	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103021823	NB 12.00 INCHES; THICKNESS 115 MM	1	NOs		11240	11240
812	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103022123	NB 18.00 INCHES; THICKNESS 115 MM	1	NOs		14180	14180
813	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103030000	BLIND FLANGE ASSEMBLIES					
814	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103030615	NB 01.00 INCHES; THICKNESS 75 MM	3	NOs		3120	9360
815	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103031318	NB 04.00 INCHES; THICKNESS 90 MM	39	NOs		5390	210210
816	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103031620	NB 08.00 INCHES; THICKNESS 100 MM	13	NOs		8070	104910
817	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103031723	NB 10.00 INCHES; THICKNESS 115 MM	17	NOs		10130	172210
818	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103040000	VALVE ASSEMBLIES					
819	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103040615	NB 01.00 INCHES; THICKNESS 75 MM	12	NOs		6240	74880
820	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103040918	NB 02.00 INCHES; THICKNESS 90 MM	2	NOs		8570	17140
821	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103041620	NB 08.00 INCHES; THICKNESS 100 MM	2	NOs		16150	32300
822	A	B957-999-16-43-PK-SOR-9501-A-3M	M60103041823	NB 12.00 INCHES; THICKNESS 115 MM	2	NOs		22490	44980
823	A	B957-999-16-43-PK-SOR-9501-A-3M	M60133000000	INSULATION TYPE : IS; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL					
824	A	B957-999-16-43-PK-SOR-9501-A-3M	M60133010000	PIPES					
825	A	B957-999-16-43-PK-SOR-9501-A-3M	M60133011105	NB 03.00 INCHES; THICKNESS 25 MM	270	Metres		2830	764100
826	A	B957-999-16-43-PK-SOR-9501-A-3M	M60133012005	NB 16.00 INCHES; THICKNESS 25 MM	385	Metres		9390	3615150
827	A	B957-999-16-43-PK-SOR-9501-A-3M	M62200000000	INSULATION MATERIAL : ROCKWOOL+PIC					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
828	A	B957-999-16-43-PK-SOR-9501-A-3M	M699000000	HOT INSULATION (OFFSITES) ; Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with sheet cladding as per spec. , providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
829	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e. 290 mm calcium silicate linner layer) & 75 mm In Situ-PUF (Outer layer) with 50 micron Mylar foil between inner & outer layers of Insulation to be considered for VHP steam headers. As per Job Spec: B957-420-06-43-IL01					
830	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010010	PIPES					
831	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010020	NB 0.5 INCH - 1.5 INCH	15	Metres		9440	141600
832	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010030	NB 2 INCH - 6 INCH	15	Metres		15860	237900
833	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010040	NB 8 INCH - 14 INCH	115	Metres		29890	3437350
834	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010050	NB 16 INCH - 24 INCH	875	Metres		43610	38158750
835	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010060	BLIND FLANGE ASSEMBLIES					
836	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010070	NB 8 INCH - 14 INCH	29	Nos.		29890	866810
837	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010080	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 125 mm Rockwool (Inner layer) & 75 mm PIR (Outer layer) to be provided. As per Job Spec: B957-420-06-43-IL01					
838	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010090	PIPES					
839	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010100	NB 8 INCH - 14 INCH	50	Metres		13530	676500
840	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010110	NB 16 INCH - 24 INCH	1150	Metres		18980	21827000
841	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010120	BLIND FLANGE ASSEMBLIES					
842	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010130	NB 8 INCH - 14 INCH	23	Nos.		13530	311190
843	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010140	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 125 mm Rockwool (Inner layer) & 15 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer) to be provided. As per Job Spec: B957-420-06-43-IL01					
844	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010150	PIPES					
845	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010160	NB 8 INCH - 14 INCH	50	Metres		26700	1335000
846	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010170	NB 16 INCH - 24 INCH	290	Metres		40680	11797200
847	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010180	BLIND FLANGE ASSEMBLIES					
848	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010190	NB 8 INCH - 14 INCH	17	Nos.		26700	453900
849	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010200	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 115 mm Rockwool (Inner layer) & 15 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer)to be provided. As per Job Spec: B957-420-06-43-IL01					
850	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010210	PIPES					
851	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010220	NB 2 INCH - 6 INCH	325	Metres		12100	3932500
852	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010230	NB 8 INCH - 14 INCH	1810	Metres		26280	47566800
853	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010240	NB 16 INCH - 24 INCH	25	Metres		40140	1003500
854	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010250	BLIND FLANGE ASSEMBLIES					
855	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010260	NB 2 INCH - 6 INCH	37	Nos.		12100	447700
856	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010270	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL : Special insulation i.e. 75 mm Rockwool (Inner layer) & 10 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer) to be provided for all LP steam lines. As per Job Spec: B957-420-06-43-IL01					
857	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010280	NB 0.5 INCH - 1.5 INCH	175	Metres		5270	922250
858	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010290	NB 2 INCH - 6 INCH	1315	Metres		9370	12321550
859	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010300	NB 8 INCH - 14 INCH	900	Metres		20220	18198000
860	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010310	NB 16 INCH - 24 INCH	1630	Metres		30760	50138800
861	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010320	NB 26 INCH - 32 INCH	1710	Metres		44220	75616200
862	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010330	BLIND FLANGE ASSEMBLIES					
863	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010340	NB 0.5 INCH - 1.5 INCH	2	Nos.		5270	10540
864	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010350	NB 2 INCH - 6 INCH	17	Nos.		9370	159290
865	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010360	NB 8 INCH - 14 INCH	62	Nos.		20220	1253640
866	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010370	NB 16 INCH - 24 INCH	2	Nos.		30760	61520
867	A	B957-999-16-43-PK-SOR-9501-A-3M	M699010380	NB 26 INCH - 32 INCH	2	Nos.		44220	88440

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
868	A	B957-999-16-43-PK-SOR-9501-A-3M	M80000000000	INSULATION OF ELETRICAL TRACED LINES (OFFSITES): Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumable and other necessary materials ,testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, all binding, tying, lacing, stitching and/or otherwise securing , finishing with cladding as per spec., providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer- in-charge. (Refer Legend for applicable EIL specification)					
869	A	B957-999-16-43-PK-SOR-9501-A-3M	M82000000000	INSULATION MATERIAL : ROCKWOOL+PUF OR ROCKWOOL+PIC					
870	A	B957-999-16-43-PK-SOR-9501-A-3M	M82057000000	INSULATION TYPE : IE; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL+PUF OR ROCKWOOL+PIC					
871	A	B957-999-16-43-PK-SOR-9501-A-3M	M82057010000	PIPES					
872	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570104AA	NB 00.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	10	Metres		2510	25100
873	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570105AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	20	Metres		2640	52800
874	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570106AA	NB 01.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	35	Metres		2790	97650
875	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570108AA	NB 01.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	10	Metres		3120	31200
876	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570109AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	25	Metres		3400	85000
877	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570111AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	15	Metres		4030	60450
878	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570113AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	980	Metres		4600	4508000
879	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570115AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	8525	Metres		5800	49445000
880	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570116AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	680	Metres		6940	4719200
881	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570116DA	NB 08.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	730	Metres		7840	5723200
882	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570117AA	NB 10.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	4985	Metres		8150	40627750
883	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570118AA	NB 12.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	60	Metres		9290	557400
884	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570124AA	NB 24.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	2450	Metres		15680	38416000
885	A	B957-999-16-43-PK-SOR-9501-A-3M	M82057020000	FLANGE ASSEMBLIES					
886	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570209AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	3	NOs		3400	10200
887	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570211AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	1	NOs		4030	4030
888	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570213AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	5	NOs		4600	23000
889	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570216AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	1	NOs		6940	6940
890	A	B957-999-16-43-PK-SOR-9501-A-3M	M82057030000	BLIND FLANGE ASSEMBLIES					
891	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570305AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	21	NOs		2640	55440
892	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570315AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		5800	52200
893	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570316AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	3	NOs		6940	20820
894	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570317AA	NB 10.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	1	NOs		8150	8150
895	A	B957-999-16-43-PK-SOR-9501-A-3M	M82057040000	VALVE ASSEMBLIES					
896	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570404AA	NB 00.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	5	NOs		5030	25150
897	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570405AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	44	NOs		5280	232320
898	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570406AA	NB 01.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	8	NOs		5580	44640
899	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570408AA	NB 01.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		6240	56160
900	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570409AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		6790	61110
901	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570411AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	7	NOs		8060	56420
902	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570413AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		9200	82800
903	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570415AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	36	NOs		11610	417960
904	A	B957-999-16-43-PK-SOR-9501-A-3M	M820570416AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		13880	124920
905	A	B957-999-16-43-PK-SOR-9501-A-3M	M82200000000	INSULATION MATERIAL : ROCKWOOL+PIC					
906	A	B957-999-16-43-PK-SOR-9501-A-3M	M82257000000	INSULATION TYPE : IE; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C)					
907	A	B957-999-16-43-PK-SOR-9501-A-3M	M82257010000	PIPES					
908	A	B957-999-16-43-PK-SOR-9501-A-3M	M822570104AA	NB 0.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	450	Metres		2510	1129500
909	A	B957-999-16-43-PK-SOR-9501-A-3M	M82258000000	INSULATION TYPE : IE; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 176 (DEG C) TO 350 (DEG C)					
910	A	B957-999-16-43-PK-SOR-9501-A-3M	M82258010000	PIPES					
911	A	B957-999-16-43-PK-SOR-9501-A-3M	M822580104	NB 00.50 INCHES; THICKNESS MM	130	Metres		3220	418600

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
912	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0000000000	COLD INSULATION (OFFSITES) Providing thermal insulation including supply of all insulating and ancillary materials, Aluminium foil for SS surfaces, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required , including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory works there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with cladding as per spec., providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
913	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0700000000	INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
914	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765000000	INSULATION TYPE : IC; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
915	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765010000	PIPES					
916	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765010505	NB 00.75 INCHES; THICKNESS 25 MM	10	Metres		1720	17200
917	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765010605	NB 01.00 INCHES; THICKNESS 25 MM	15	Metres		1880	28200
918	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011308	NB 04.00 INCHES; THICKNESS 40 MM	170	Metres		4680	795600
919	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011318	NB 04.00 INCHES; THICKNESS 90 MM	10	Metres		7990	79900
920	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011513	NB 06.00 INCHES; THICKNESS 65 MM	550	Metres		7760	4268000
921	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011518	NB 06.00 INCHES; THICKNESS 90 MM	10	Metres		9620	96200
922	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011620	NB 08.00 INCHES; THICKNESS 100 MM	3660	Metres		11990	43883400
923	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765011823	NB 12.00 INCHES; THICKNESS 115 MM	700	Metres		16690	11683000
924	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765020000	FLANGE ASSEMBLIES					
925	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765021308	NB 04.00 INCHES; THICKNESS 40 MM	1	NOs		4680	4680
926	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765030000	BLIND FLANGE ASSEMBLIES					
927	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765030505	NB 00.75 INCHES; THICKNESS 25 MM	2	NOs		1720	3440
928	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765030605	NB 01.00 INCHES; THICKNESS 25 MM	1	NOs		1880	1880
929	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765031308	NB 04.00 INCHES; THICKNESS 40 MM	2	NOs		4680	9360
930	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765040000	VALVE ASSEMBLIES					
931	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765040505	NB 00.75 INCHES; THICKNESS 25 MM	3	NOs		3440	10320
932	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765040605	NB 01.00 INCHES; THICKNESS 25 MM	2	NOs		3760	7520
933	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0765041308	NB 04.00 INCHES; THICKNESS 40 MM	3	NOs		9350	28050
934	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768000000	INSULATION TYPE : IC; SURFACE MATERIAL : SS; OPERATING TEMP. RANGE : UPTO -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
935	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768010000	PIPES					
936	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768011518	NB 06.00 INCHES; THICKNESS 90 MM	1150	Metres		9820	11293000
937	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768011620	NB 08.00 INCHES; THICKNESS 100 MM	10	Metres		13540	135400
938	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768040000	VALVE ASSEMBLIES					
939	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0768041620	NB 08.00 INCHES; THICKNESS 100 MM	1	NOs		27080	27080
940	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769000000	INSULATION TYPE : IC; SURFACE MATERIAL : SS; OPERATING TEMP. RANGE : BELOW -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
941	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010000	PIPES					
942	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010413	NB 00.50 INCHES; THICKNESS 65 MM	10	Metres		3800	38000
943	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010513	NB 00.75 INCHES; THICKNESS 65 MM	10	Metres		3940	39400
944	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010615	NB 01.00 INCHES; THICKNESS 75 MM	85	Metres		4740	402900
945	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010815	NB 01.50 INCHES; THICKNESS 75 MM	10	Metres		5180	51800
946	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769010918	NB 02.00 INCHES; THICKNESS 90 MM	100	Metres		6510	651000
947	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769011328	NB 04.00 INCHES; THICKNESS 140 MM	10	Metres		12060	120600
948	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769011523	NB 06.00 INCHES; THICKNESS 115 MM	115	Metres		11850	1362750
949	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769011530	NB 06.00 INCHES; THICKNESS 150 MM	670	Metres		14890	9976300
950	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769011630	NB 08.00 INCHES; THICKNESS 150 MM	825	Metres		16760	13827000
951	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769020000	FLANGE ASSEMBLIES					
952	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769020815	NB 01.50 INCHES; THICKNESS 75 MM	1	NOs		5180	5180
953	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769021523	NB 06.00 INCHES; THICKNESS 115 MM	1	NOs		11850	11850
954	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769030000	BLIND FLANGE ASSEMBLIES					
955	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769030513	NB 00.75 INCHES; THICKNESS 65 MM	5	NOs		3940	19700
956	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769040000	VALVE ASSEMBLIES					
957	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769040413	NB 00.50 INCHES; THICKNESS 65 MM	2	NOs		7590	15180
958	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769040513	NB 00.75 INCHES; THICKNESS 65 MM	10	NOs		7890	78900

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
959	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769040615	NB 01.00 INCHES; THICKNESS 75 MM	5	NOs		9470	47350
960	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769040918	NB 02.00 INCHES; THICKNESS 90 MM	3	NOs		13010	39030
961	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769041118	NB 03.00 INCHES; THICKNESS 90 MM	2	NOs		14780	29560
962	A	B957-999-16-43-PK-SOR-9501-A-3M	MB0769041523	NB 06.00 INCHES; THICKNESS 115 MM	12	NOs		23700	284400
963	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE	ELECTRICAL WORKS					
964	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB09	Supply, installation, testing and commissioning of following 415 V, 3 Phase, TPN, 50Hz, outdoor, weather proof, fixed type smart feeder pillars with feeder controller for controlling street lighting poles and hybrid solar street light poles, hardware required for connection with smart lighting control system, complete with canopy for additional weather protection, including supply and fixing of all required cable glands & lugs, including termination of cables, including construction of foundation, including transportation from store/yard to site at the place of installation, proper storage, assembly, installation, aligning, levelling, testing, calibration of meters, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. 100A Feeder Pillar with (100A incomer MCCB - 1 NOS, 63A outgoing MCCB - 5 NOS) Note: RCCB with 30mA rating shall be provided in all outgoing feeders. Incomer shall be provided with voltmeter, ammeter with selector switches, contactor and synchronous timer. All MCCB shall be with shunt trip coil and shall be microprocessor based with O/L, S/C & E/F protection.	7	nos		678770	4751390
965	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB11	AC Hi-pot/HV testing of insulation (as per IEC-60840) for 66kV cables of following sizes comprising of High voltage AC resonance testing at various frequencies (72 kV AC Voltage will be applied for 60 minutes continuously) including supply of necessary hardware, shifting of kit, transportation to place of testing, labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge. Length up to 150 meters.					
966	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB11.01	1C x 240 sq.mm. cable	48	nos		46350	2224800
967	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB11.02	1C x 400 sq.mm. cable	3	nos		46350	139050
968	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB12	AC Hi-pot/HV testing of insulation (as per IEC-60840) for 66kV cables of following sizes comprising of High voltage AC resonance testing at various frequencies (72 kV AC Voltage will be applied for 60 minutes continuously) including supply of necessary hardware, shifting of kit, transportation to place of testing, labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge. Length more than 150 meter and less than 1500 meters.					
969	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB12.01	1C x 240 sq.mm. cable	18	nos		92700	1668600
970	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB12.02	1C x 400 sq.mm. cable	1	nos		92700	92700
971	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB13	AC Hi-pot/HV testing of insulation (as per IEC-60840) for 66kV cables of following sizes comprising of High voltage AC resonance testing at various frequencies (72 kV AC Voltage will be applied for 60 minutes continuously) including supply of necessary hardware, shifting of kit, transportation to place of testing, labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge. Length more than 1500 meter and less than 3750 meters.					
972	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB13.01	1C x 240 sq.mm. cable	51	nos		185400	9455400
973	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB13.02	1C x 400 sq.mm. cable	18	nos		185400	3337200
974	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB14	Smart Lighting Control Network Design, Engineering, supply, installation including laying of Fibre optic cables, testing and commissioning of smart lighting control network for all existing and new smart high masts & smart street lighting including supply of Fiber optic cables & HDPE ducts of required length, LIU kits, ethernet switches, termination accessories, centralized control system comprising of HMI-PC, interface with upstream ECS system and downstream interface with smart lighting system (i.e. 30 mtr High mast, street light pole and hybrid solar street lighting poles) and all necessary hardware, software etc. as per approved drawings, specifications of this tender and directions of Engineer-in-charge.	1	Lumpsum		4853360	4853360
975	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB15	NIFPS: Installation, testing and commissioning of complete NIFPS system excluding the construction of foundation, including laying and termination of cables, pipe fittings, valves, flanges etc. for NIFPS system, transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, including connection of auxiliary circuits, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
976	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB15.01	66/6.9 kV, 20/25 MVA transformers	10	nos		463500	4635000
977	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB16	Modification of existing Weatherproof 30 meter Smart High Mast to make it suitable for connection with Smart Lighting Control Network through optical fiber cables along with all accessories such as LIU, patch cords, splicers, switches etc. including supply, installation, testing and commissioning of all hardware, all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	43	nos		78084	3357612
978	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB17	Modification of existing Flameproof 30 meter Smart High Mast to make it suitable for connection with Smart Lighting Control Network through optical fiber cables along with accessories such as LIU, patch cords, splicers, switches, etc. including supply, installation, testing and commissioning of all hardware, recertification for hazardous area for the modification (as applicable), all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	10	nos		78084	780840
979	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20	MV (415V) FEEDER MODIFICATION / ADDITION Supply, installation, connection (internal wiring), testing and commissioning of drawout type following feeders for 415V Switchgear in vacant module in existing switchboards as per hardware datasheet and component datasheet B957-000-16-50-DS-1802, including interfacing with existing Substation Automation System (SAS) & ECS including all cabling & connections & requisite modifications in existing SAS/ECS, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Services of OEM shall be availed, Name of OEM shall be furnished during detail engineering)					
980	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.01	32A MCCB with E/F release feeder as per hardware datasheet B957-000-16-50-DS-1830	2	nos		32960	65920

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981	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.02	63A MCCB with E/F release feeder as per hardware datasheet B957-000-16-50-DS-1830.	2	nos		32960	65920
982	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.03	63A MCCB with E/F release feeder with timer and contactor as per hardware datasheet B957-000-16-50-DS-1837.	2	nos		40170	80340
983	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.04	125A MCCB with E/F release feeder with Contactor as per hardware datasheet B957-000-16-50-DS-1831.	2	nos		51500	103000
984	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.05	250A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		61800	123600
985	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.06	FVNR-15 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1826	2	nos		51500	103000
986	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.07	FVNR-30 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1828	2	nos		56650	113300
987	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.08	FVNR-60 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1828.	2	nos		72100	144200
988	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.09	FVNR-100 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1829	2	nos		82400	164800
989	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.10	FVNR-150 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1829.	2	nos		113300	226600
990	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.11	400A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		123600	247200
991	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.12	32A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		41200	82400
992	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB20.13	63A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		43260	86520
993	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB21	FLAME PROOF MOV DISTRIBUTION BOARD (FLP MOV DB)					
994	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB21.01	Supply of flameproof (Ex-d) and weather proof type 12 way MOV DB along with 2 nos. control junction box for gas group IIA/ IIB, T3, 415V, TPN, free standing floor mounting type/pedestal mounted type, dust and vermin proof with canopy suitable for outdoor installation including supply of FLP double compression brass nickel plated cable glands, lugs including all labour and materials, as per approved drawings, specifications 6-51-0007 and data sheets of this tender and directions of Engineer-in-Charge. FLP MOV DB shall have 2 nos. incomers, 415 V, 125A, TPN, 50 kA (1 sec), heavy duty switch and mechanical (castle key) interlock between incomer, voltmeter with selector Switches and ammeter with selector switches for each incomers with phase indication lamp. MCCB at incomer shall have 4-pole. 12 nos. 415V TP outgoing feeders each rated 32A with switch fuse unit with phase indication lamp.	2	nos		843570	1687140
995	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB22	HV PANEL EXTENSION Supply, installation, testing and commissioning of new indoor drawout type HV Panel as EXTENSION PANEL of existing 6.6kV HV switchboard of main bus bar rating 630A, 40kA for 1 sec, including interconnection of shipping section and requisite inter panel wiring between shipping sections, including supply of all new bus bars, new numerical relay, new CTs, new 630A vacuum circuit breaker, interfacing with existing Substation Automation System (SAS) & ECS including all cabling & connections & requisite modifications in existing SAS/ECS, installation on foundations or steel structures, aligning, levelling grouting, as per EIL Specification 6-51-0001, including any other modifications in the existing HV Switchboard to meet the Tender requirements etc. including all labour and materials, approved drawings, specifications of this tender, and directions of Engineer-in-Charge. Services of OEM (M/s SIEMENS) shall be availed.					
996	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB22.01	630A, Plant Feeder as per hardware datasheet no. B957-000-16-50-DS-0124 including feeder differential relay. Feeder differential relay (87F) shall include both sending end as well as receiving end units. Receiving end unit shall be free issued by Contractor for installation by others in their downstream switchboards.	2	nos		1514986	3029972
997	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB23	ELECTRIC HEAT TRACING SYSTEM					
998	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB23.01	Design, Engineering and supply including procurement services all equipment / materials for Electrical Heat tracing system (other than those pertaining to civil & structure, insulation painting and mechanical, Instrumentation works pertaining to site installation of equipment/ material) including heater tape,tracers, junction boxes, RTDs, central monitoring system, power distribution board (PDB), Local distribution panel (LDP), etc., complete earthing system, cabling system comprising of supply of all incoming and outgoing power and control cables of PDB and LDP i.e. all power and control cables from owner's substation to PDB/ LDP, PDB to LDP, PDBs/ LDPs to tracers/RTDs, communication cable from controllers to central monitoring system, multi circuit temperature controller, junction boxes, T-connectors, heating tape, tracer, communication cables (as required), necessary connectors, all materials including supply of MS Supports, GI Earthing Strips, earthing items, sands, bricks etc. and associated GI cable trays/ RCC trenches for electrical traced lines/ equipment under BPREP Project BPCL-Bina Refinery, including commissioning spares, special tools & tackles and consumables required for completing and establishing a fully functional and operative electrical Heat Tracing System and associated facilities including all other activities incidental to procurement and supply, complete as per scope of work/ supplies detailed in various section of bidding document, drawings, specifications including EIL specification 6-51-0095, Scope of supply & work and Job Specification and other provision of bidding document and directions of Engineer-In-Charge.	1	Lumpsum		160710900	160710900
999	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB23.02	Construction, fabrication, installation, testing, mechanical completion, pre commissioning, commissioning required for completing and establishing a fully functional and operative electrical heat tracing system and associated facilities for electrical traced lines/ equipment including any balance field engineering under BPREP Project BPCL-Bina Refinery. Supply of all materials required for completion of the job (excluding those covered under supply portion in item no. 01EE.MB23.01), inclusive of earthing works, RCC cable trenches, cable trays, all cable laying, connection & termination of all power & control cables from owner's substation to PDB/ LDP, PDB to LDP, PDB/LDP to tracers/RTDs, communication cables for fault alarms and communication cable from LDP to central monitoring system as defined in the tender, testing of multi circuit temperature controller, testing, labour, tools & tackles, consumables, transportation of materials from contractor's warehouse to work site, providing construction and all other activities, including civil works such as concrete foundations, excavation, disposal of surplus earth, levelling, grouting/ welding, bolting, riveting etc. as required complete in all respects as per bidding document, drawings, specifications, Scope of supply & work and Job Specification and direction of Engineer-In-Charge.	1	Lumpsum		53570300	53570300

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1000	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB24	Supply, installation, testing and commissioning of following 415 V, 3 Phase, TPN, 50Hz, outdoor, weather proof, fixed type feeder pillars (Incomer shall have voltmeter and ammeter with selector switches) complete with canopy for additional weather protection, including supply and fixing of all required cable glands & lugs, including termination of cables, including construction of foundation, including transportation from store/yard to site at the place of installation, proper storage, assembly, installation, aligning, levelling, testing, calibration of meters, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. 160A Feeder Pillar with (160A incomer MCCB - 1 NOS, 63A outgoing MCCB - 5 NOS) Note: RCCB with 30mA rating shall be provided in all outgoing feeders. Incomer shall be provided with contactor and synchronous timer. All MCCB shall be with shunt trip coil and shall be microprocessor based with O/L, S/C & E/F protection	11	nos		582434	6406774
1001	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB25	MCB BOX for Battery Rooms					
1002	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB25.01	Supply, installation, connection, testing and commissioning of safe area MCB Box surface/flush mounted type, wall mounting type (with hinged cover) sheet steel enclosure with canopy having 4 nos. single pole MCBs (9kA type, upto 20 A) with complete wiring, suitable for outdoor, IP 55 weatherproof, including cable termination, connection and fixing of cable glands (for 4 nos. incoming and 4 nos. outgoing, 3C X 2.5 sqmm. Armored cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	2	nos		61800	123600
1003	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB26	Deployment of skilled manpower (As per requirement indicated in the attached job specification) for carrying out various activities associated to Electrical works as per direction of Engineer-in -charge.	1	Man month		38563	38563
1004	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.MB27	Deployment of un-skilled manpower (As per requirement indicated in the attached job specification) for carrying out various activities associated to Electrical works as per direction of Engineer-in -charge.	1	Man month		22763	22763
1005	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010	TRANSFORMERS					
1006	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.30	Installation of transformers of the following ratings excluding the construction of foundation, including transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, including connection of auxiliary circuits, topping up with oil and testing of oil with contractor's own test equipment, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1007	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.30.MC01	2 Winding ONAN/ONAF outdoor transformer with OLTC. 66 kV / 6.9 kV 20/25 MVA	10	nos		322905	3229050
1008	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.30.20V1	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 2.5 MV·A	10	nos		32847	328470
1009	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.30.20V6	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 1.25 MV·A	1	nos		30148	30148
1010	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.30.20V8	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 3.15 MV·A	8	nos		41488	331904
1011	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.40	Filtration of transformer oil by stream line filter machine provided by the contractor for improving the insulation strength of oil to the required strength, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge. (Excluding the supply of oil).					
1012	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.40.10	Filtration of transformer oil with dissolved gas analysis test.	42680	Litre		32	1365760
1013	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.40.20	Filtration of transformer oil without dissolved gas analysis test.	99580	Litre		22	2190760
1014	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.50	Supply of transformer oil conforming to IS-335 in non-returnable 220 litre drums for topping up various transformers. The oil shall be tested prior to filling up and improved by filtering, if required, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge.					
1015	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.50.10	No. of Drums.	2	nos		31291	62582
1016	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.60	Supply of dry type transformers with accessories, including nuts and bolts etc., as per EIL standard specification No. 6-51-0042, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1017	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.60.10V1	2 Winding Dry type transformers. .415 kV / .415 kV 150 kV·A	6	nos		810569	4863414
1018	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.60.10V2	2 Winding Dry type transformers. .415 kV / .415 kV 250 kV·A	12	nos		1179515	14154180
1019	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.70	Installation, testing and commissioning of dry transformer of following rating, including transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, connection of auxiliary circuits, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1020	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.70.10V1	2 Winding Dry type transformers. .415 kV / .415 kV 150 kV·A	6	nos		19014	114084
1021	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.70.10V2	2 Winding Dry type transformers. .415 kV / .415 kV 250 kV·A	12	nos		23659	283908
1022	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.110	Testing and commissioning of transformers of the following rating including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
1023	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.110.MC01	2 Winding ONAN/ONAF outdoor transformer with OLTC. 66 kV / 6.9 kV 20/25 MVA	10	nos		322905	3229050
1024	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.110.20V1	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 2.5 MV·A	10	nos		27017	270170
1025	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.110.20V9	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 1.25 MV·A	1	nos		13359	13359
1026	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1010.110.20V11	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 3.15 MV·A	8	nos		32785	262280
1027	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020	SWITCHBOARDS / UPS / VSD / BATTERY CHARGERS / PANELS					
1028	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.MB10	Installation, testing & commissioning of 66kV SF6 Gas insulated Isolated Breaker panels (IBPs) including Unloading at site, site handling including transportation from store to work site, storage at site, assembly at site, SF6 gas filling as required, installation including laying and termination of interconnecting cabling between 66KV GIS, Local control cubicle (LCC) & Control relay panel (CRP), between CRP & Sub Station Automation System, testing, pre-commissioning, commissioning of GIS including testing and commissioning of numerical relay and metering LAN at site, handing over to Client including all labour and materials as per approved drawings, specifications of this tender and directions of Engineer-in-charge. (The above activity shall be carried out by 66kV GIS OEM M/s SIEMENS)					
1029	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.MB10.02	66kV, 630 Amps, 40kA for 3 sec. GIS Isolating Breaker panels (IBPs)	10	nos		537969	5379690

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1030	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.30	Installation, testing and commissioning of bus ducts of following ratings between transformer secondary and the switchgear incomer panel, including transportation from store/yard to site at the place of installation, unpacking, making connections and installation of bends, breaking of walls and making good of the same etc., (but excluding structural supports), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1031	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.30.10V3	Air Insulated/segregated bus ducts 415 V 4000 A 65 kA for 1 second	150	m		7560	1134000
1032	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.30.10V8	Air Insulated/segregated bus ducts 6600 V 2500 A 40 kA for 1 second	150	m		5408	811200
1033	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.30.10V15	Air Insulated/segregated bus ducts 415 V 5000 A 65 kA for 1 second	120	m		9177	1101240
1034	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.30.10V16	Air Insulated/segregated bus ducts 415 V 2000 A 65 kA for 1 second	15	m		3790	56850
1035	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.MB40	Installation, testing and commissioning of 6.6kV Switchgear External gas ducts (for release of gases due to internal arc) between 6.6 KV switchboard and 6.6kV isolation breaker panel, 6.6 KV switchboard/6.6kV isolation breaker panel and switchgear wall (as per the switchboard Vendor drawings), including transportation from store/yard to site at the place of installation, unpacking, making connections and installation of bends, breaking of walls and making good of the same etc., (but excluding structural supports), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Work involves removal of existing false ceiling if required as per site requirement for providing structural supports for gas duct and reinstalling false ceiling.					
1036	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.MB40.01	Gas duct	50	m		41200	2060000
1037	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200	Installation, testing and commissioning of switch-boards, relay and control panels, annunciation panels, UPS system, battery chargers, distribution boards, cubicles with electrical equipment, VSD panels, misc .electrical panels etc., including transportation from store/yard to site at the place of installation, lifting the panels by deployment of tyre mounted hydraulic trollies, unpacking, assembly, including mounting and wiring of loose parts supplied by equipment vendor, interconnection of shipping sections and requisite inter-panel wiring between shipping sections, including supply of all wiring materials, installation on foundations or fixing to wall or steel structures, aligning, levelling, grouting, testing and calibration of relays and meters etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1038	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.10	Weight of the Unit upto 100 kg	5	nos		4007	20035
1039	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.20	Weight of the Unit from 101 upto 500 kg.	10	nos		6592	65920
1040	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.30	Weight of the Unit from 501 upto 1000 kg.	50	nos		8539	426950
1041	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.40	Weight of the Unit from 1001 upto 1500 kg.	210	nos		10485	2201850
1042	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.50	Weight of the Unit from 1501 upto 3000 kg.	200	nos		15780	3156000
1043	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.200.60	Weight of the Unit from 3001 upto 5000 kg.	5	nos		26255	131275
1044	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210	Installation of switch-boards, relay and control panels, annunciation panels, UPS system, battery chargers, distribution boards, cubicles with electrical equipment, VSD panels, misc .electrical panels etc., including transportation from store/yard to site at the place of installation, lifting the panels by deployment of tyre mounted hydraulic trollies, unpacking, assembly, including mounting and wiring of loose parts supplied by equipment vendor, interconnection of shipping sections and requisite inter-panel wiring between shipping sections, including supply of all wiring materials, installation on foundations or fixing to wall or steel structures, aligning, levelling, grouting, testing and calibration of relays and meters etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1045	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.10	Weight of the Unit upto 100 kg	10	nos		2709	27090
1046	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.20	Weight of the Unit from 101 upto 500 kg.	50	nos		5953	297650
1047	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.30	Weight of the Unit from 501 upto 1000 kg.	50	nos		7890	394500
1048	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.40	Weight of the Unit from 1001 upto 1500 kg.	5	nos		9826	49130
1049	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.50	Weight of the Unit from 1501 upto 3000 kg.	2	nos		15120	30240
1050	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.210.60	Weight of the Unit from 3001 upto 5000 kg.	1	nos		45917	45917
1051	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.250	Design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing, delivery to site including all labour and materials along with supply of special tools & tackles for following Fixed type PDB as per 6-51-0012 with 415 V, 3 Phase, TPN, 50Hz Incomer and 240V single phase outgoing feeders as mentioned below, complete with documentations as per approved drawings, specifications, data sheets and other codes & standards attached or referred with this tender and directions of Engineer-in-charge.					
1052	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1020.250.MB02	415V fixed type PDB rated for (Bus Fault Rating - 50 KA (1 Sec), No. of Incomers - 2Nos, Incomer MCCB rating - 200 Amps, Outgoing Double Pole MCB of 16 Amps - 60 Nos (out of which 15 nos. feeders shall be provided with ammeter), Outgoing Double Pole MCB of 32 Amps - 20 Nos, Outgoing Double Pole MCB of 63 Amps - 10 Nos) INCOMER SHALL BE MECHANICALLY INTERLOCKED	4	nos		398095	1592380
1053	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040	MISCELLANEOUS CONTROL GEAR					
1054	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.10	Installation, testing and commissioning of miscellaneous surface mounted industrial/FLP control gear such as lighting/power panel, push button stations, motor starter, communication equipment, junction boxes, panels, plugs, sockets, including supply of necessary hardware, touch up painting including supply of paint, including transportation from store/yard to site at the place of installation, unpacking, (excluding fixing of cable glands and cable terminations), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1055	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.10.10	Weight of the unit up to 5 kg.	10	nos		865	8650
1056	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.10.20	Weight of the unit above 5 kg. but upto 20 kg.	65	nos		2122	137930
1057	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.10.30	Weight of the unit above 20 kg. but upto 100 kg.	10	nos		4079	40790
1058	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.20	Supply of Industrial, weather proof type Push Button stations as per EIL specification No. 6-51-0014, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1059	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.20.50	With start,stop push buttons, one Three position selector switch and ammeter.	5	nos		7076	35380
1060	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.20.MB50	with stop push button (break glass type) and indicating lamps for ON/OFF	35	nos		9898	346430
1061	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30	Supply of flameproof and weather proof type Push Button station as per EIL standard specification No. 6-51-0006 as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1062	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB100	With Stop push button Gas Group IIA/IIB, Temp Class T3	1	nos		5408	5408
1063	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB200	With Stop push buttons Gas Group IIC, Temp Class T3	1	nos		5408	5408
1064	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB500	With Start, Stop push buttons and ammeter Gas Group IIA/IIB, Temp Class T3	1	nos		10094	10094
1065	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB600	With Start, Stop push buttons and ammeter Gas Group IIC, Temp Class T3	1	nos		10094	10094
1066	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB900	With Start, Stop push buttons, One Three Position selector Switch and Ammeter Gas Group IIA/IIB, Temp Class T3	1	nos		13740	13740
1067	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.30.MB910	With Start, Stop push buttons, One Three Position selector Switch and Ammeter Gas Group IIC, Temp Class T3	1	nos		13740	13740
1068	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.40	Supply of weatherproof 415V, 3 phase, 50 Hz, AC DOL starters of the following ratings with suitable switchfuse, contactor, thermal relay , On/Off indicating lamps including double compression brass nickel plated cable glands, tinned copper lugs, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1069	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1040.40.10	Upto 5.5 kW.	2	nos		19735	39470
1070	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050	DC SYSTEM / BATTERY BANK					
1071	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60	Installation of stationary nickel-cadmium battery banks of the following ratings, including transportation from store/yard to site at the place of installation, filling with electrolyte, aligning, levelling, grouting, assembly of battery racks, fixing of inter-cell connectors etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1072	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V67	Nickel-cadmium battery banks rated for 110 V 830 Ah	2	nos		77250	154500
1073	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V68	Nickel-cadmium battery banks rated for 110 V 230 Ah	2	nos		38192	76384
1074	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V71	Nickel-cadmium battery banks rated for 110 V 590 Ah	2	nos		70421	140842
1075	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V72	Nickel-cadmium battery banks rated for 110 V 290 Ah	2	nos		38192	76384
1076	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V73	Nickel-cadmium battery banks rated for 110 V 1130 Ah	2	nos		82400	164800
1077	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V74	Nickel-cadmium battery banks rated for 110 V 390 Ah	2	nos		41200	82400
1078	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V78	Nickel-cadmium battery banks rated for 384 V 180 Ah	2	nos		77250	154500
1079	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1050.60.10V79	Nickel-cadmium battery banks rated for 228 V 280 Ah	6	nos		82400	494400
1080	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060	PLUGS, SOCKETS AND JUNCTION BOXES					
1081	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10	Supply of weatherproof metal clad 415V, TPN, industrial type socket and plug with heavy duty interlocking switch, with adequately sized cable adaptor box for incoming and outgoing cable terminations, including supply of double compression brass nickel plated cable glands, tinned copper lugs, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1082	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.10	63 A, 415 V, 5 pin sockets.	5	nos		16212	81060
1083	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.40	63 A, 415 V, 5 pin sockets along with associated 5 pin plugs.	65	nos		22670	1473550
1084	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.80	240 V, 15 A, 3 pin sockets along with associated 3 pin plugs.	30	nos		4305	129150
1085	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.90	24 V, 5 A, 3 pin socket WITH TRANSFORMER.(240/24V)	5	nos		2338	11690
1086	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.100	24 V, 5 A, 3 pin sockets along with associated 3 pin plugs. WITH TRANSFORMER.(240/24V)	5	nos		2802	14010
1087	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.10.110	24 V, 60 W, handlamps.	5	nos		4645	23225
1088	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20	Supply of following types of FLP(II A/II B) and WP sockets, plugs and handlamps as per EIL specification No. 6-51-0021, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1089	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.10	63 A, 415 V, 5 pin socket.	5	nos		23247	116235
1090	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.20	63 A, 415 V, 5 pin Plugs for item no. 01EE.1060.20.10	5	nos		8219	41095
1091	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.30	63A, 415V, 4 pin socket.	5	nos		17108	85540
1092	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.40	63 A, 415 V, 4 pin plugs for item no. 01EE.1060.20.30	5	nos		5717	28585
1093	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.70	240 V, 15 A, 3 pin socket.	5	nos		6510	32550
1094	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.20.70	5	nos		3842	19210
1095	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.90	24 V, 5 A, 3 pin socket WITH TRANSFORMER.(240/24V)	5	nos		2668	13340
1096	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.100	24 V, 5 A, 3 pin sockets along with associated 3 pin plugs. WITH TRANSFORMER.(240/24V)	5	nos		3317	16585
1097	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.20.110	24 V, 60 W, handlamps.	5	nos		5552	27760
1098	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30	Supply of following types of FLP (II C) and WP sockets, plugs and handlamps as per EIL specification No. 6-51-0021, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1099	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.10	63 A, 415 V, 5 pin socket.	5	nos		27089	135445
1100	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.20	63 A, 415 V, 5 pin Plugs for item no. 01EE.1060.30.10	5	nos		9455	47275
1101	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.70	240 V, 15 A, 3 pin socket.	5	nos		5727	28635
1102	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.30.70	5	nos		3368	16840
1103	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.90	24 V, 5 A, 3 pin socket.	5	nos		3955	19775
1104	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.100	24 V, 5 A, 3 pin Plugs for item no. 01EE.1060.30.90	5	nos		3224	16120
1105	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.30.110	24 V, 60 W, handlamps.	5	nos		5408	27040

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1106	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.40	Supply, installation, cable termination, connection, testing and commissioning of following types of FLP and WP junction boxes, as per EIL specification No. 6-51-0061, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1107	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.40.10	FLP (IIA/IIB) and WP JB with 15 A, 16 terminals suitable for 1 No. incoming and 6 Nos. outgoing cable entries complete with FLP cable glands for incoming and outgoing cables and 3 Nos. blocking plugs.	5	nos		9919	49595
1108	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.40.20	FLP (IIA/IIB) and WP JB with 15 A, 16 terminals suitable for 1 No. incoming and 12 Nos. outgoing cable entries complete with FLP cable glands for incoming and outgoing cables and 4 Nos. blocking plugs.	5	nos		9919	49595
1109	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.40.30	FLP(II A/II B) and WP 3 way JB complete with 3 Nos. FLP cable glands and 1 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	5	nos		13339	66695
1110	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.40.40	FLP(II A/II B) and WP 4 way JB complete with 4 Nos. FLP cable glands and 2 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	5	nos		18447	92235
1111	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.50	Supply, installation, cable termination, connection, testing and commissioning of following types of FLP and WP junction boxes, suitable for gas group IIA/IIB, temperature class T3, as per EIL specification No. 6-51-0061, including suitably sized busbars with current rating equal to the largest cable current rating, glands, lugs, earthing terminals, canopy etc, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1112	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.50.10V5	Suitable for 415V system with 2 Run(s) of 3 core 185 mm² incoming cable(s) and 1 Run(s) of 3 core 120 mm² outgoing cable(s)	1	nos		22403	22403
1113	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.50.10V10	Suitable for 415V system with 2 Run(s) of 3 core 150 mm² incoming cable(s) and 1 Run(s) of 3 core 95 mm² outgoing cable(s)	1	nos		21064	21064
1114	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1060.50.10V12	Suitable for 415V system with 3 Run(s) of 3 core 185 mm² incoming cable(s) and 1 Run(s) of 3 core 240 mm² outgoing cable(s)	1	nos		39789	39789
1115	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1070	NEUTRAL GROUNDING RESISTOR					
1116	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1070.10	Supply of following rating of outdoor type neutral grounding resistor, as per EIL standard specification no.6-51-0043, including all labour and materials, as per approved drawings, specifications of this tnder and directions of Engineer-in-Charge.					
1117	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1070.10.10V2	NGR rated for 3.81 kV 600 A	10	nos		314593	3145930
1118	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1070.20	Installation, testing and commissioning of outdoor type following neutral grounding resistor consisting of cast iron/stainless steel grid resistor with/without neutral CT including connection of one end of resistor with transformer neutral and the other end of the resistor to the earthing grid, including transportation from store/yard to site at the place of installation, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1119	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1070.20.10V1	NGR rated for 3.81 kV 600 A	10	nos		16181	161810
1120	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080	CAPACITOR BANKS					
1121	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20	Installation of following H.V. capacitor banks, series reactor and RVT, including transportation from store/yard to site of installation, unpacking, assembly of elevating structure, interconnection of loose parts supplied by equipment vendor, aligning, levelling etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1122	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V4	HV capacitor banks rated for 1400 kVAR 6.6 kV	2	nos		76241	152482
1123	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V5	HV capacitor banks rated for 2500 kVAR 6.6 kV	8	nos		97850	782800
1124	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V7	HV capacitor banks rated for 4000 kVAR 6.6 kV	2	nos		128750	257500
1125	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V11	HV capacitor banks rated for 2700 kVAR 6.6 kV	2	nos		106481	212962
1126	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V23	HV capacitor banks rated for 2400 kVAR 6.6 kV	4	nos		96820	387280
1127	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1080.20.10V24	HV capacitor banks rated for 1850 kVAR 6.6 kV	2	nos		82400	164800
1128	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090	CANOPIES					
1129	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.10	Supply, fabrication and installation of canopies for miscellaneous outdoor equipment like motors, fire alarm points, telephones, communication hand set stations etc. to render them weatherproof made out of 1.6 mm (16 gauge) sheet steel including supply of hardware and paint, painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	100	kg		350	35000
1130	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20	Supply, fabrication and installation of FRP canopies for outdoor electrical motors of following frame sizes to render them weather proof including supply of necessary hardware for fixing and clamping with the motor foundation, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1131	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.10	Frame size upto 80.	2	nos		2987	5974
1132	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.20	Frame size more than 80 and upto 112.	2	nos		3523	7046
1133	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.30	Frame size more than 112 and upto 180.	2	nos		6942	13884
1134	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.40	Frame size more than 180 and upto 250.	2	nos		11526	23052
1135	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.50	Frame size more than 250 and upto 315.	2	nos		23041	46082
1136	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.60	Frame size more than 315 and upto 450.	2	nos		27089	54178
1137	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.70	Frame size more than 450 and upto 630.	2	nos		45969	91938
1138	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.20.80	Frame size more than 630.	2	nos		86170	172340
1139	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.30	Supply, fabrication and installation of FRP canopies for outdoor electrical miscellaneous equipments such as lighting/power panels and distribution junction boxes, local panels , PB stations etc. to render them weather proof including supply of necessary hardware for fixing and clamping with the equipment, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1140	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.30.10	Lighting Panel/Power panel/distribution junctions boxes.	5	nos		4594	22970
1141	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.30.20	Manual call points/field call stations.	5	nos		4594	22970
1142	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.30.30	Push button stations.	5	nos		4594	22970
1143	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1090.30.40	FLP receptacles.	5	nos		4594	22970

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1144	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100	ANCHOR FASTENERS					
1145	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10	Supply, drilling in RCC and fixing of metallic anchor fasteners for supporting of cable trays and miscellaneous electrical switchgear of following sizes, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1146	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.10	3/16" BSW.	200	nos		138	27600
1147	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.20	5/16" BSW.	200	nos		148	29600
1148	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.30	1/4" BSW.	200	nos		148	29600
1149	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.40	3/8" BSW.	1000	nos		180	180000
1150	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.50	5/8" BSW.	2500	nos		212	530000
1151	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1100.10.60	1/2" BSW.	2000	nos		201	402000
1152	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110	TESTING AND COMMISSIONING OF MOTORS					
1153	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10	Testing and commissioning of MV motors of following ratings and checking of all interface connections, change of grease, wherever required, including supply of approved type of grease, no load/full load running of motor, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1154	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.10	Upto 5.5 kW.	25	nos		2060	51500
1155	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.20	Above 5.5 kW but upto 11 kW.	20	nos		2709	54180
1156	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.30	Above 11 kW but upto 22 kW.	25	nos		4007	100175
1157	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.40	Above 22 kW but upto 45 kW.	20	nos		4645	92900
1158	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.50	Above 45 kW but upto 75 kW.	10	nos		7241	72410
1159	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.60	Above 75 kW but upto 125 kW.	5	nos		9826	49130
1160	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.10.MB75	Above 125 kW but upto 132 kW	2	nos		13256	26512
1161	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20	Testing and commissioning of HV motors of following ratings and checking of all interface connections, change of grease in bearings, wherever required, including supply of approved type of grease, no load/full load running of motor, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
1162	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20.10	Above 132 kW but upto 400 kW.	10	nos		17026	170260
1163	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20.20	Above 400 kW but upto 800 kW.	2	nos		18344	36688
1164	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20.30	Above 800 kW but upto 1200 kW.	2	nos		22928	45856
1165	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20.40	Above 1200 kW but upto 2000 kW.	15	nos		32744	491160
1166	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.20.50	Above 2000 kW but upto 3000 kW.	15	nos		34711	520665
1167	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.30	Testing and commissioning of safe area/ FLP motor operated valve actuators with integral starter of different sizes, checking of all interface connections, local/remote controls, settings of limit and torque switches, no load/full load running, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
1168	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.30.10	Safe area/FLP motor operated valve actuators.	50	nos		3935	196750
1169	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.40	Testing and commissioning of 415V, TPN, Lube Oil Heaters of following ratings, checking of all interface connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in- Charge					
1170	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.40.10	Upto 5.5 kW	5	nos		1627	8135
1171	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.40.MB10	Above 22 kW	2	nos		4378	8756
1172	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.40.20	Above 5.5 kW and upto 11 kW	5	nos		2163	10815
1173	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.40.30	Above 11 kW and upto 22kW	5	nos		3245	16225
1174	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.50	Testing and commissioning of 240V, SPN, Lube Oil Heaters of following ratings, checking of all interface connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in- Charge					
1175	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1110.50.10	Upto 5.5 kW	2	nos		1627	3254
1176	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1120	DISMANTLING AND DISCONNECTION OF ELECTRICAL EQUIPMENTS.					
1177	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1120.50	Disconnection, dismantling of 30M High Mast Lighting (HML) system complete with associated lighting fixtures and its feeder pillar box including disconnection of cables, de-compounding and cleaning of cable boxes etc., including transporting to owner's store, including all labour and materials, as per specifications of this tender and as per directions of Engineer-in-Charge.	2	nos		92360	184720
1178	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1120.60V4	Dismantling of existing 30M High Mast Lighting (HML) System including dismantling and relocation of 30M HML complete with associated lighting Fixtures and its Feeder Pillar Box and relocating the HML system from one location to another for a distance of upto 1000 m including providing its foundation at the new location comprising of all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, new set of foundation bolts, and all other sundry materials/ hardware, special cables etc. as required for each high masts, including fixing and connection of fixtures, cables, earthing, lightning rods and all mounting accessories and hardware as required reinstallation, testing & commissioning of street light poles along with its associated lighting fixtures including all labour and materials as per approved drawings, EIL specifications, specification of this tender and directions of Engineer-in-Charge.	2	nos		126144	252288

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1179	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1120.70V4	Dismantling of existing street lighting poles of height 11 m including dismantling and relocation of these street lighting poles complete with associated Lighting Fixtures and its marshalling box and relocating the street lighting pole and its marshalling box from one location to another for a distance of upto 300 m including providing its foundation at the new location comprising of all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, new set of foundation bolts, and all other sundry materials/ hardware, special cables etc. as required for each high masts, including fixing and connection of fixtures, cables, earthing, lightning rods and all mounting accessories and hardware as required, testing & commissioning of street light poles along with its associated lighting fixtures including all labour and materials as per approved drawings, EIL specifications, specification of this tender and directions of Engineer-in-Charge.	2	nos		113530	227060
1180	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1120.70V5	Dismantling of existing street lighting poles of height 9 m including dismantling and relocation of these street lighting poles complete with associated Lighting Fixtures and its marshalling box and relocating the street lighting pole and its marshalling box from one location to another for a distance of upto 300 m including providing its foundation at the new location comprising of all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, new set of foundation bolts, and all other sundry materials/ hardware, special cables etc. as required for each high masts, including fixing and connection of fixtures, cables, earthing, lightning rods and all mounting accessories and hardware as required, testing & commissioning of street light poles along with its associated lighting fixtures including all labour and materials as per approved drawings, EIL specifications, specification of this tender and directions of Engineer-in-Charge.	2	nos		102186	204372
1181	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130	SAFETY EQUIPMENT					
1182	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10	Supply and installation of the following, including the supply of necessary clamps, bolts, rawl plugs etc., breaking and making good of walls, if required, mounting, including all labour and materials, complete and as per applicable standards and CEA Guidelines and as per directions of Engineer-in-Charge.					
1183	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB10	Wall mounted Illuminated type Electrical Single Line Diagrams-A0 size" for the unit including frame, power supply hardware, LED fittings, sockets, glass, etc.	5	nos		15450	77250
1184	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.20	First Aid Boxes.	5	nos		3100	15500
1185	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB20	True RMS Digital Multimeter with Display of up to 3 digits of decimal.	3	nos		26883	80649
1186	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB30	Clamp on earth meggar	3	nos		18849	56547
1187	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.60	Sand buckets with stand (Each with at least 3 sand buckets).	20	nos		4491	89820
1188	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB60	HV tester & HV Tapes	3	nos		32960	98880
1189	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB75	Artificial respirator	3	nos		3811	11433
1190	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.80	Shock hazard charts - Laminated type	20	nos		1689	33780
1191	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.90	Gas Mask for use in substation during fire & smoke as per CEA guidelines	3	nos		7787	23361
1192	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.10.MB105	LOTO system facility (Box, lock & Key, HASP, Wire etc.)	3	nos		6283	18849
1193	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.20	Supply and laying of 900 mm wide safety insulation mats complying to IS-15652, of following grades required for maintenance of electrical equipment in substation, including cutting to required shape in running length, including all labour and materials, as per applicable Indian or International standards and CEA Guidelines and as per directions of Engineer-in-Charge.					
1194	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.20.10	3.3 kV grade.	100	m		2884	288400
1195	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.20.20	11 kV grade.	10	m		3451	34510
1196	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.20.30	33 kV grade.	10	m		4017	40170
1197	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30	Supply of following items as per applicable Indian standards/CEA Guidelines.					
1198	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.10	Rubber hand gloves (11 kV grade).	6	pair		3461	20766
1199	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.20	Rubber hand gloves (33 kV grade).	6	pair		5057	30342
1200	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.30	Enamelled caution boards.	6	nos		1308	7848
1201	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.40	Discharge rod with earthing facility (upto 11 kV grade).	6	nos		12803	76818
1202	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.50	Discharge rod with earthing facility (Above11 kV & 33kV).	6	nos		19199	115194
1203	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.30.70	HV fuse puller handle.	6	nos		927	5562
1204	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.40	Supply and application/installation of epoxy based insulation coating with breakdown voltage as per IS, suitable for system voltage as marked and shall be suitable for installation on concrete flooring of substation in airconditioned/non-airconditioned area, having smooth finish, including all labour and materials, complete as per approved drawings, job & standard specification attached with this tender and directions of the engineer-in-charge					
1205	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1130.40.40	For highest systen voltage of 7.2kV	3500	m²		2287	8004500
1206	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140	SUPPLY OF SPARES / LAMPS					
1207	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20	MV HRC Fuses					
1208	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.10	16 A.	5	nos		128	640
1209	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.20	32 A.	5	nos		179	895
1210	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.30	63 A.	5	nos		253	1265
1211	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.40	100 A.	5	nos		444	2220
1212	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.50	160 A.	5	nos		729	3645
1213	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.60	250 A.	5	nos		867	4335
1214	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.70	315 A.	5	nos		920	4600

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1215	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.20.80	400 A.	5	nos		1036	5180
1216	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.30	LAMPS					
1217	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.30.MB10	LED Lamp (4000-4500 LUMENS, 100 LM/Watt) for well glass Ltg. fixtures	5	nos		1648	8240
1218	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.30.MB20	LED Lamp (6500-7000 LUMENS, 100 LM/Watt) for well glass Ltg. fixtures.	5	nos		1978	9890
1219	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.30.MB30	LED Lamp (6500-7000 LUMENS, 100 LM/Watt) for flood Ltg. fixtures	5	nos		3790	18950
1220	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1140.30.MB40	LED Lamp (10000-10500 LUMENS, 100 LM/Watt) for flood Ltg. fixtures	5	nos		4738	23690
1221	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1150	CCOE APPROVAL					
1222	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.1150.10	Obtaining approval from CCoE(Chief Controller of Explosives)for imported equipment such as motors, local control panels, junction boxes & misc. equipment, etc. based on the type test certificates made available from the equipment/sub vendor supplier including submission of application to statutory authorities, necessary fee, all test certificates, equipment drawings in required volume, interaction with the authority, perusal of approval and obtaining necessary approval certificate before the energisation of equipment as per specification of this tender and direction of Engineer in charge.	1	nos		161792	161792
1223	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010	SUPPLY OF MV CABLES					
1224	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.30	Supply of 1100 V grade, Copper Conductor,XLPE insulated and armoured, cables of following sizes as per EIL standard specification No. 6-51-0051, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
1225	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.30.20	3 C x 2.5 sq. mm	2000	m		113	226000
1226	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.30.30	4 C x 2.5 sq. mm	2000	m		134	268000
1227	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.50	Supply of 1100 V grade, Aluminium Conductor, XLPE insulated and armoured, cables of following sizes as per EIL standard specification No. 6-51-0051, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
1228	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.50.270	3.5 C x 70 sq. mm	1000	m		319	319000
1229	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.50.380	3.5 C x 185 sq. mm	500	m		783	391500
1230	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.60	Supply of 1100 V grade, Copper Conductor, Individual pair shielded & Overall shielded, twisted pair/triad, XLPE insulated, Armored, FRLS outer-sheathed cables of following sizes as per EIL standard specification No. 6-51-0052, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
1231	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.60.110	2 Pair x 2.5 sq. mm	1000	m		196	196000
1232	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.60.130	4 Pair x 2.5 sq. mm	1000	m		330	330000
1233	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.60.140	6 Pair x 2.5 sq. mm	1000	m		474	474000
1234	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2010.60.170	12 Pair x 2.5 sq. mm	1000	m		876	876000
1235	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040	LAYING OF CABLES					
1236	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15	Laying of cables of different voltage grade and types of the following overall diameters in ready trays/trenches/ supported on structure/pull through pipes including supply and fixing of stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles & saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1237	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.01	Cables with OD upto 20 mm.	110000	m		31	3410000
1238	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.02	Cables with OD above 20 mm but upto 30 mm.	120000	m		41	4920000
1239	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.03	Cables with OD above 30 mm but upto 40 mm.	30000	m		52	1560000
1240	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.04	Cables with OD above 40 mm but upto 50 mm.	75000	metre		72	5400000
1241	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.05	Cables with OD above 50 mm but upto 60 mm.	5000	m		93	465000
1242	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.06	Cables with OD above 60 mm but upto 80 mm.	60000	m		113	6780000
1243	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB15.07	Cables with OD above 80 mm but upto 100 mm.	1000	m		144	144000
1244	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25	Laying of cables (using cable pulling by motorized winch with torque limits) of different voltage grade and types of the following overall diameters in ready trays/trenches/ supported on structure/pull through pipes including supply and fixing of stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles & saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1245	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.01	Cables with OD upto 20 mm.	50000	m		41	2050000
1246	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.02	Cables with OD above 20 mm but upto 30 mm.	55000	m		52	2860000
1247	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.03	Cables with OD above 30 mm but upto 40 mm.	15000	m		72	1080000
1248	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.04	Cables with OD above 40 mm but upto 50 mm.	35000	m		82	2870000
1249	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.05	Cables with OD above 50 mm but upto 60 mm.	1000	m		103	103000
1250	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.06	Cables with OD above 60 mm but upto 80 mm.	25000	m		113	2825000
1251	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB25.07	Cables with OD above 80 mm but upto 100 mm.	500	m		175	87500

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1252	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA30	Laying of 66 kV (E), Copper conductor, XLPE insulated, Un-armoured cables of following sizes in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/ trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
1253	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA30.01	1C x 240 sq.mm.	106400	m		340	36176000
1254	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA30.02	1C x 400 sq.mm.	25900	m		453	11732700
1255	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA40	Laying of 66 kV (E), Copper conductor, XLPE insulated, Un-Armoured cables of following sizes (using cable pulling by motorized winch with torque limits) in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/ trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
1256	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA40.01	1C x 240 sq.mm.	45600	m		330	15048000
1257	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MA40.02	1C x 400 sq.mm.	11100	m		433	4806300
1258	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB55	Laying of XLPE insulated, armoured cables of following sizes in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
1259	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB55.01	6.6kV, 1C x 630 sq. mm, Aluminum Conductor	14000	m		412	5768000
1260	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB65	Laying of XLPE insulated, Armoured cables of following sizes (using cable pulling by motorized winch with torque limits) in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/ trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
1261	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2040.MB65.01	6.6kV, 1C x 630 sq. mm, Aluminum Conductor	6000	m		433	2598000
1262	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050	END TERMINATIONS					
1263	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.MB30	Termination of Earthed grade EHV cables and connection of leads including supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug onto the conductor, restoration of the insulation, clamping of cable cores and earthing of armour, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excluding supply of heat / cold shrinkable termination kits). (The above activity shall be carried out by cable OEM. OEM name shall be informed during detail engineering)					
1264	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.MB30.01	1 Core cable termination kit for 66 kV 400 mm²	3	nos		27130	81390
1265	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.MB30.02	1 Core cable termination kit for 66 kV 240 mm²	42	nos		24421	1025682
1266	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60	Supply of Unearthed grade H.V. termination kits of (indoor/outdoor type) as per EIL standard specification No. 6-51-0051, excluding cable glands and lugs, as per approved drawings and as per specifications of this tender and directions of Engineer-in-Charge.					
1267	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60.10V1	3 Core cable Indoor termination kit for 6.6 kV 300 mm²	50	nos		9074	453700
1268	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60.10V3	3 Core cable Indoor termination kit for 6.6 kV 240 mm²	60	nos		8621	517260
1269	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60.20V3	1 Core cable Indoor termination kit for 6.6 kV 630 mm²	40	nos		6808	272320
1270	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60.30V2	3 Core cable Outdoor termination kit for 6.6 kV 240 mm²	2	nos		10784	21568
1271	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.60.30V3	3 Core cable Outdoor termination kit for 6.6 kV 300 mm²	2	nos		12401	24802
1272	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.80	Termination of Unearthed grade HV cables and connection of leads including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug onto the conductor, restoration of the insulation, clamping of cable cores and earthing of armour, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excluding supply of termination kits and cable glands).					
1273	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.80.10V1	3 Core cable termination kit for 6.6 kV 300 mm²	52	nos		6489	337428
1274	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.80.10V2	3 Core cable termination kit for 6.6 kV 240 mm²	62	nos		6242	387004
1275	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.80.20V2	1 Core cable termination kit for 6.6 kV 630 mm²	40	nos		5408	216320

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1276	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100	Termination of XLPE insulated armoured power cables (up to 1100 V grade) and connection of leads excluding the supply of cable glands and lugs but including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable-cores, marking with wire number, ferrules etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1277	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.10	Cables with OD upto 20 mm.	1000	nos		227	227000
1278	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.20	Cables with OD above 20 mm but upto 30 mm.	250	nos		330	82500
1279	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.30	Cables with OD above 30 mm but upto 40 mm.	300	nos		402	120600
1280	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.40	Cables with OD above 40 mm but upto 50 mm.	200	nos		577	115400
1281	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.50	Cables with OD above 50 mm but upto 60 mm.	300	nos		731	219300
1282	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		1082	10820
1283	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.100.70	Cables with OD above 80 mm but upto 100 mm.	2	nos		1349	2698
1284	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.110	Termination of communication, fire alarm & control paired cables and connection of leads excluding the supply of cable glands and lugs but including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting, stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable- cores, marking with wire number, ferrules etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1285	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.110.40	All sizes from 1P to 4P and upto 2.5 sq. mm	500	nos		340	170000
1286	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.110.50	All sizes from 5P to 10P and upto 2.5 sq. mm	200	nos		402	80400
1287	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.110.60	All sizes from 11P to 15P and upto 2.5 sq. mm	200	nos		577	115400
1288	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2050.120	Fire proofing of cables including supply of all fire proofing paint, including all labour and materials, as per IEC-60331, specifications of this tender and directions of Engineer-in- Charge. (Actual area of surface painted shall be measured).	80	m^2		1957	156560
1289	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060	STRAIGHT THROUGH JOINTS					
1290	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10	Supply and Making of heat shrinkable type straight through joints for 1100 volt grade power cables as per EIL standard specification No. 6-51-0051, including cutting, stripping of cable insulation complete with supply of compression / crimping type ferrules, plastic mould and epoxy resin compound etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1291	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.10	Cables with OD upto 20 mm.	5	nos		2215	11075
1292	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.20	Cables with OD above 20 mm but upto 30 mm.	5	nos		4058	20290
1293	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.30	Cables with OD above 30 mm but upto 40 mm.	5	nos		5799	28995
1294	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.40	Cables with OD above 40 mm but upto 50 mm.	5	nos		8333	41665
1295	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.50	Cables with OD above 50 mm but upto 60 mm.	5	nos		10424	52120
1296	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.10.60	Cables with OD above 60 mm but upto 80 mm.	5	nos		14461	72305
1297	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.30	Supply of heat shrinkable type Straight through jointing kits for Unearthed grade H.V. cables of the following sizes, as per EIL standard specification No. 6-51-0051, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1298	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.30.10V1	3 Core cable Straight through jointing kits for 6.6 kV 300 mm^2	20	nos		23968	479360
1299	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.30.10V2	3 Core cable Straight through jointing kits for 6.6 kV 240 mm^2	6	nos		22670	136020
1300	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.30.20V1	1 Core cable Straight through jointing kits for 6.6 kV 630 mm^2	40	nos		18138	725520
1301	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.40	Making of Straight through joints for H.V. cables of following sizes excluding supply of jointing kit and accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1302	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.40.10V1	3 Core cable Straight through jointing kits for 6.6 kV 300 mm^2	20	nos		5830	116600
1303	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.40.10V2	3 Core cable Straight through jointing kits for 6.6 kV 240 mm^2	6	nos		5335	32010
1304	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.40.20V3	1 Core cable Straight through jointing kits for 6.6 kV 630 mm^2	40	nos		3409	136360
1305	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.MB120	Making of Straight through joints for E.H.V. cables of following sizes excluding supply of jointing kit and accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (The above activities shall be carried out by cable OEM. Name of OEM shall be informed during detail engineering)					
1306	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.MB120.01	1 Core cable Straight through jointing kits for 66 kV 240 mm^2	138	nos		27233	3758154
1307	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.MB120.02	1 Core cable Straight through jointing kits for 66 kV 400 mm^2	36	nos		28593	1029348
1308	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.130	Supply and Making of heat shrinkable type straight through joints for communication, fire alarm & control paired cables, including cutting, stripping of cable insulation complete with supply of compression / crimping type ferrules, plastic mould and epoxy resin compound etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1309	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.130.40	All sizes from 1P to 4P and upto 2.5 sq. mm	5	nos		2256	11280
1310	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.130.50	All sizes from 5P to 10P and upto 2.5 sq. mm	5	nos		3420	17100
1311	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2060.130.60	All sizes from 11P to 15P and upto 2.5 sq. mm	5	nos		4882	24410
1312	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070	G.I. & PVC PIPES					
1313	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.10	Supply and laying of following sizes of G.I. Pipes (medium) in required length fixed on steel, concrete or similar structure, laid in trenches, ready to be buried in concrete including cutting, threading, bending and similar works, supply of clamps, small iron structures, spacers and installation of seats, plugs, bushings etc., small civil works, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1314	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.10.20	50 mm NB.	250	m		1030	257500

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1315	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.10.50	100 mm NB.	250	m		2915	728750
1316	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.10.70	150 mm NB.	250	m		4965	1241250
1317	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.20	Supply and laying of following sizes of PVC Pipes in required length fixed on steel, concrete or similar structure, laid in trenches, ready to be buried in concrete including cutting, threading, supply of bends and similar works, supply of clamps, small iron structures, spacers and installation of seats, plugs, bushings etc., small civil works, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1318	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.20.20	50 mm NB.	50	m		227	11350
1319	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.20.50	100 mm NB.	50	m		824	41200
1320	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2070.20.70	150 mm NB.	50	m		1895	94750
1321	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080	STRUCTURAL STEEL					
1322	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB10	Supply, fabrication and installation of MS base frames, supports for switchgear, and brackets for miscellaneous electrical equipments, cable and cable tray supports out of rolled MS sections, pipes, plates etc. including shot blasting, welding, bolting, riveting, supply of necessary anchor bolts and grouting etc., supply of paint and applying of anti-rust primer coat and finished coats of approved synthetic enamel paint (as per painting Specification attached with tender) suitable for highly corrosive environment, including breaking walls, floors etc. for structures as required including supply of all GI hardware materials, all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Any item weighing up to 1kg. or less shall neither be measured nor paid).	2500	Kg		124	310000
1323	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB20	Supply and installation of push button station supports complete with base plate, foundations bolts, grouting and painting as per Specification for surface preparation and protective coating (as per painting specification attached with tender) suitable for highly corrosive environment etc., including all labour and materials, as per approved drawings and directions of Engineer-in-Charge.					
1324	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB20.01	As per std. 7-51-0306	60	nos		4182	250920
1325	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB20.02	As per std. 7-51-0307	5	nos		4182	20910
1326	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB20.03	As per std. 7-51-0307	5	nos		4872	24360
1327	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2080.MB20.04	As per std. 7-51-0317	5	nos		5356	26780
1328	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090	CABLE - TRAYS					
1329	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10	Supply and installation of prefabricated hot dip galvanised steel cable trays, fabricated out of hot rolled sheet steel with rigid welded construction ladder type with a rung as per std. 7-51-0333, of approved make and cable tray fittings, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1330	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.10	300 mm wide Straight run cable tray.	2000	m		1535	3070000
1331	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.MB10	Horizontal bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5809	1365115
1332	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.20	450 mm wide Straight run cable tray.	400	m		1648	659200
1333	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.MB20	Vertical outside bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5418	1273230
1334	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.MB30	Vertical inside bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5727	1345845
1335	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.40	750 mm wide Straight run cable tray.	103250	m		1885	194626250
1336	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.MB40	Tee Joints for 750 mm wide tray with 1600 mm bending radius.	15	nos		8197	122955
1337	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.MB50	Cross Joints for 750 mm wide tray with 1600 mm bending radius.	30	nos		6953	208590
1338	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.450	Reducers 750 - 450 RHS.	5	nos		4707	23535
1339	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.460	Reducers 750 - 450 LHS.	5	nos		4707	23535
1340	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.470	Reducers 750 - 300 RHS.	5	nos		4305	21525
1341	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.480	Reducers 750 - 300 LHS.	5	nos		4305	21525
1342	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.490	Reducers 450 - 300 RHS.	5	nos		4027	20135
1343	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.500	Reducers 450 - 300 LHS.	5	nos		4027	20135
1344	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.510	Reducers 600 - 450 RHS.	5	nos		4305	21525
1345	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.520	Reducers 600 - 450 LHS.	5	nos		4305	21525
1346	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.530	Reducers 600 - 300 RHS.	5	nos		4027	20135
1347	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.540	Reducers 600 - 300 LHS.	5	nos		4027	20135
1348	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.550	Reducers 750 - 600 RHS.	5	nos		5047	25235
1349	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.560	Reducers 750 - 600 LHS.	5	nos		5047	25235
1350	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.570	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	40	nos		3636	145440
1351	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.580	Horizontal bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
1352	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.600	Horizontal bends for 750 mm wide tray with 1000 mm bending radius.	240	nos		5047	1211280
1353	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.610	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius	70	nos		3770	263900
1354	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.620	Vertical outside bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
1355	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.640	Vertical outside bends for 750 mm wide tray with 1000 mm bending radius.	235	nos		5047	1186045
1356	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.650	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius	10	nos		3636	36360
1357	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.660	Vertical inside bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
1358	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.680	Vertical inside bends for 750 mm wide tray with 1000 mm bending radius.	165	nos		5047	832755

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1359	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.690	Tee Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		5232	26160
1360	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.700	Tee Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		6046	30230
1361	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.720	Tee Joints for 750 mm wide tray with 1000 mm bending radius.	35	nos		7128	249480
1362	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.730	Cross Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		4707	23535
1363	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.740	Cross Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		5047	25235
1364	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.10.760	Cross Joints for 750 mm wide tray with 1000 mm bending radius.	15	nos		6046	90690
1365	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.30	Supply and installation of following galvanised slotted channel trays of 2 mm thickness and 50 mm high for supporting cables, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1366	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.30.10	100 mm wide.	3050	m		597	1820850
1367	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.30.20	150 mm wide.	350	m		793	277550
1368	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.30.30	60 mm wide.	160	m		340	54400
1369	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.40	Supply, fabrication and installation of 0.91 mm (20 gauge) GI sheet covers for cable trays, including necessary hardwares, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	30400	m²		1813	55115200
1370	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50	Supply and installation of prefabricated ladder type Fibre reinforced plastic(FRP) cable trays of approved make with a rung and cable tray fittings similar to trays as per std.7-51-0333, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge					
1371	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.10	300 mm wide Straight run cable tray.	60	m		1349	80940
1372	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.20	450 mm wide Straight run cable tray.	60	m		1483	88980
1373	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.40	750 mm wide Straight run cable tray.	12510	m		1978	24744780
1374	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.50	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
1375	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.60	Horizontal bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
1376	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.70	Horizontal bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
1377	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.80	Horizontal bends for 750 mm wide tray with 1000 mm bending radius.	30	nos		6046	181380
1378	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.90	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
1379	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.100	Vertical outside bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
1380	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.110	Vertical outside bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
1381	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.120	Vertical outside bends for 750 mm wide tray with 1000 mm bending radius.	30	nos		6056	181680
1382	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.130	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
1383	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.140	Vertical inside bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
1384	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.150	Vertical inside bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
1385	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.160	Vertical inside bends for 750 mm wide tray with 1000 mm bending radius.	30	nos		6046	181380
1386	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.170	Tee Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
1387	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.180	Tee Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		5593	27965
1388	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.190	Tee Joints for 600 mm wide tray with 1000 mm bending radius.	5	nos		5861	29305
1389	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.200	Tee Joints for 750 mm wide tray with 1000 mm bending radius.	5	nos		6056	30280
1390	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.210	Cross Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		4316	21580
1391	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.220	Cross Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		4707	23535
1392	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.230	Cross Joints for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
1393	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.240	Cross Joints for 750 mm wide tray with 1000 mm bending radius.	5	nos		5644	28220
1394	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.250	Reducers 750 - 450 RHS	5	nos		4316	21580
1395	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.260	Reducers 750 - 450 LHS	5	nos		4316	21580
1396	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.270	Reducers 750 - 300 RHS	5	nos		4450	22250
1397	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.280	Reducers 750 - 300 LHS	5	nos		4450	22250
1398	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.290	Reducers 450 - 300 RHS	5	nos		4573	22865
1399	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.300	Reducers 450 - 300 LHS	5	nos		4573	22865
1400	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.310	Reducers 600 - 450 RHS	5	nos		4707	23535
1401	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.320	Reducers 600 - 450 LHS	5	nos		4707	23535
1402	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.330	Reducers 600 - 300 RHS	5	nos		4027	20135
1403	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.340	Reducers 600 - 300 LHS	5	nos		4027	20135
1404	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.350	Reducers 750 - 600 RHS	5	nos		4717	23585
1405	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2090.50.360	Reducers 750 - 600 LHS	5	nos		4707	23535
1406	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100	CABLE GLANDS					
1407	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10	Supply of nickel-plated, flame proof IIA/IIB double compression type brass cable glands, suitable for out door terminations of armoured PVC cables of following overall diameter (excluding termination and connection of cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1408	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.10	Cables with OD upto 20 mm.	10	nos		381	3810

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1409	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		680	6800
1410	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		1092	10920
1411	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1906	19060
1412	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2173	21730
1413	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		2925	29250
1414	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.10.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
1415	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20	Supply of nickel-plated, flame proof IIC double compression type brass cable glands, suitable for out door terminations of armoured PVC cables of following overall diameter (excluding termination and connection of cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1416	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.10	Cables with OD upto 20 mm.	10	nos		494	4940
1417	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		556	5560
1418	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		1257	12570
1419	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1782	17820
1420	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2709	27090
1421	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		3255	32550
1422	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.20.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
1423	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30	Supply of nickel plated brass double compression cable glands suitable for outdoor installations (WP) of following overall diameter (excluding termination and connections of cables), including drilling of suitable holes in equipments for fixing purposes etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1424	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.10	Cables with OD upto 20 mm.	10	nos		330	3300
1425	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		556	5560
1426	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		927	9270
1427	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1463	14630
1428	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2173	21730
1429	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		3255	32550
1430	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.30.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
1431	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40	Supply of nickel plated brass single compression cable glands of following overall diameter (excluding termination and connections of cables), including drilling of suitable holes in equipments for fixing purposes etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1432	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.10	Cables with OD upto 20 mm.	5	nos		180	900
1433	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.20	Cables with OD above 20 mm but upto 30 mm.	5	nos		299	1495
1434	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.30	Cables with OD above 30 mm but upto 40 mm.	5	nos		556	2780
1435	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.40	Cables with OD above 40 mm but upto 50 mm.	5	nos		690	3450
1436	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.50	Cables with OD above 50 mm but upto 60 mm.	5	nos		1009	5045
1437	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.60	Cables with OD above 60 mm but upto 80 mm.	5	nos		1803	9015
1438	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.40.70	Cables with OD above 80 mm but upto 100 mm.	5	nos		2400	12000
1439	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50	Supply and fixing of FLP(IIA/IIB) blocking plugs for blocking unused cable entries with following diameter in outdoor electrical equipment including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1440	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.10	Cables with OD up to 20 mm	5	nos		371	1855
1441	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.20	Cables with OD above 20 mm but upto 30 mm	5	nos		536	2680
1442	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.30	Cables with OD above 30 mm but upto 40 mm	5	nos		711	3555
1443	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.40	Cables with OD above 40 mm but upto 50 mm	5	nos		968	4840
1444	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.50	Cables with OD above 50 mm but upto 60 mm	5	nos		1164	5820
1445	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.60	Cables with OD above 60 mm but upto 80 mm	5	nos		1514	7570
1446	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.50.70	Cables with OD above 80 mm but upto 100 mm	5	nos		1741	8705
1447	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60	Supply and fixing of FLP(IIC) blocking plugs for blocking unused cable entries with following diameter in outdoor electrical equipment including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1448	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.10	Cables with OD up to 20 mm	5	nos		556	2780
1449	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.20	Cables with OD above 20 mm but upto 30 mm	5	nos		546	2730
1450	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.30	Cables with OD above 30 mm but upto 40 mm	5	nos		711	3555
1451	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.40	Cables with OD above 40 mm but upto 50.0 mm	5	nos		999	4995
1452	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.50	Cables with OD above 50 mm but upto 60 mm	5	nos		1288	6440
1453	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.60	Cables with OD above 60 mm but upto 80 mm	5	nos		1463	7315
1454	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2100.60.70	Cables with OD above 80 mm but upto 100 mm	5	nos		1741	8705
1455	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2110	MARKERS					

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1456	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2110.10	Supply and installation of cable markers as per std. 7-51-0301, for underground cable runs with 14 SWG enamelled steel plate with white lettering on jade green background inclusive of providing and fixing supports, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	150	nos		1741	261150
1457	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2110.30	Supply and installation of earth pit markers for directly buried GI pipe electrodes with 14 SWG enamelled steel plate engraved with white letters BURIED, EARTH ELECTRODE on JADE green background complete with support and foundation as per approved drawings, specifications of this tender and direction of Engineer-in-Charge.	400	nos		1741	696400
1458	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120	CABLE LUGS					
1459	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.10	Supply of crimping type long barrel tinned copper lugs with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1460	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.10.10	All sizes upto 10 sq. mm	10	nos		32	320
1461	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.10.20	All sizes from 16 to 35 sq. mm	10	nos		54	540
1462	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.10.30	All sizes from 50 to 185 sq. mm	10	nos		361	3610
1463	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.10.40	All sizes from 240 to 400 sq. mm	10	nos		896	8960
1464	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.20	Supply of crimping type long barrel aluminium lugs with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1465	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.20.10	All sizes upto 10 sq. mm	10	nos		22	220
1466	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.20.20	All sizes from 16 to 35 sq. mm	10	nos		32	320
1467	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.20.30	All sizes from 50 to 185 sq. mm	10	nos		148	1480
1468	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.20.40	All sizes from 240 to 400 sq. mm	10	nos		201	2010
1469	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.30	Supply of crimping type long barrel Bimetallic lugs with Al barrel & tinned Cu palm with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1470	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.30.10	All sizes upto 10 sq. mm	10	nos		32	320
1471	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.30.20	All sizes from 16 to 35 sq. mm	10	nos		43	430
1472	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.30.30	All sizes from 50 to 185 sq. mm	10	nos		278	2780
1473	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.30.40	All sizes from 240 to 400 sq. mm	10	nos		556	5560
1474	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.40	Supply of crimping type long barrel Bimetallic lugs with tinned Cu barrel & Al palm with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1475	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.40.10	All sizes upto 10 sq. mm	10	nos		43	430
1476	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.40.20	All sizes from 16 to 35 sq. mm	10	nos		74	740
1477	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.40.30	All sizes from 50 to 185 sq. mm	10	nos		148	1480
1478	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2120.40.40	All sizes from 240 to 400 sq. mm	10	nos		201	2010
1479	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2130	INTERFACE BOX					
1480	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2130.10	Supply, installation, testing and commissioning of interface box made out of 2.03 mm (14 gauge) sheet steel, with one anti-rust coat of primer, with two finished coats of approved epoxy paint, with following No. of Clamp type terminals suitable for 2.5 sq. mm copper conductor with hinged lockable door, detachable gland plate at the bottom/top complete with termination and connections of incoming/ outgoing cables, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
1481	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2130.10.20	With 200 Terminals with overall dimensions 750 x 650 x 250 mm.	1	nos		36730	36730
1482	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2130.10.30	With 100 Terminals with overall dimensions 750 x 650 x 250 mm.	1	nos		22969	22969
1483	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2140	SEALING COMPOUND					
1484	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2140.10	Supply of sealing compound (Bituminous tar or approved equivalent) heating and pouring of compound in the cable stuffing box of flameproof motors and providing effective cable sealing, including all labour and materials, as per specifications of this tender and as per directions of Engineer-in-Charge (Measurement of weight shall be made for sealing compound supplied).	10	kg		1195	11950
1485	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160	ADAPTORS / REDUCERS / NIPPLES ETC.					
1486	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10	Supply and fixing nickel-plated brass adaptors/ reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
1487	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	10	nos		577	5770
1488	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.20	Eqpt. Thread 1" PF (J.I.S.) - E.T. Thread 3/4"ET	10	nos		577	5770
1489	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	10	nos		762	7620
1490	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	10	nos		886	8860
1491	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	10	nos		999	9990
1492	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.10.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	10	nos		1452	14520
1493	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30	Supply and fixing FLP(IIA/IIB), weatherproof, nickel-plated brass adaptors/reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
1494	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	10	nos		762	7620
1495	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.20	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 3/4"ET	10	nos		937	9370
1496	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	10	nos		937	9370

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1497	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	10	nos		1391	13910
1498	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	10	nos		1494	14940
1499	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.30.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	10	nos		1679	16790
1500	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50	Supply and fixing FLP(IIC), weatherproof, nickel-plated brass adaptors/reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
1501	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	5	nos		1483	7415
1502	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.20	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 3/4"ET	5	nos		1483	7415
1503	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	5	nos		1607	8035
1504	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	5	nos		1854	9270
1505	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	5	nos		2081	10405
1506	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.2160.50.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	5	nos		2307	11535
1507	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3010	FLOOD LIGHT MASTS					
1508	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3010.20	Design, supply, installation, testing and commissioning of high mast lighting system as per EIL specification No. 6-51-0039, data sheet, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes and all other sundry materials, special cables etc. as required for each high masts, including fixing and connection of fixtures, cables, earthing, lightning rods and all mounting accessories and hardware as required, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1509	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3010.20.MB11	30M high flood light mast for Safe Area, complete with 24 Nos. 400W dimmable LED floodlight fixtures including dimmable drivers, smart dimming controller, smart high mast feeder pillar panel, weatherproof cable glands and lugs, and all associated cabling between drivers, controllers, and feeder pillar panel, required hardware for connection with smart lighting control system, suitable for outdoor installation and compliant with tender specifications.	100	nos		1267291	126729100
1510	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3010.20.MB21	30M high flood light mast for Hazardous Area (Gas Group IIA/IIB, Temperature Class T3), complete with 24 Nos. 400W dimmable LED floodlight fixtures including dimmable drivers, smart dimming controller, smart high mast feeder pillar panel, weatherproof cable glands and lugs, and all associated cabling between drivers, controllers, and feeder pillar panel, required hardware for connection with smart lighting control system, suitable for outdoor installation and compliant with tender specifications.	21	nos		1522314	31968594
1511	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020	LIGHTING POLES					
1512	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.10	Supply and installation of street lighting poles (single bracket/double bracket) including supply and installation of marshalling box as per std. 7-51-0208 and necessary wire/cable running from marshalling box to the lighting fixture, cable termination and connection, fixing of cable glands and lugs, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1513	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.10.10	Poles as per std. 7-51-0207 sht. 1 of 2 (Single bracket).	5	nos		29087	145435
1514	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.10.20	Poles as per std. 7-51-0207 sht. 1 of 2 (Double bracket).	5	nos		34907	174535
1515	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.10.30	Poles as per std. 7-51-0207 sht. 2 of 2 (Single bracket).	5	nos		36658	183290
1516	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.10.40	Poles as per std. 7-51-0207 sht. 2 of 2 (Double bracket).	5	nos		40726	203630
1517	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.20	Supply and installation of Lighting Poles for floor mounting as per std. 7-51-0201, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, (excluding supply and installation of control gear box/junction box), but including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1518	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.20.10	Lighting poles including supply and connection of wires upto fixtures for safe areas.	5	nos		23268	116340
1519	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.20.20	Lighting poles for hazardous areas.	5	nos		22701	113505
1520	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.30	Supply and installation of platform Lighting pole as per std. 7-51-0202, including all welding, structural works, paint and all sundry materials as required, including painting, (excluding supply and installation of control gear box/junction box), but including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1521	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.30.10	Lighting poles including supply and connection of wires upto fixtures for safe areas.	55	nos		6994	384670
1522	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.30.20	Lighting poles for hazardous areas.	50	nos		8734	436700
1523	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.40	Supply and installation of Flood Light Poles as per std. 7-51-0205 (sheet 1 of 2) including supply and installation of marshalling box as per std. 7-51-0208, necessary wires running from marshalling box to the lighting fixtures, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1524	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.40.10	Flood light poles with marshalling box and wires for safe areas.	5	nos		37235	186175
1525	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.50	Supply and installation of Flood Light Pole (two) as per std. 7-51-0205 (sheet 2 of 2) (excluding the supply and installation of control gear box/ junction boxes), including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					

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1526	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.50.10	Flood light poles for hazardous areas.	5	nos		46546	232730
1527	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70	Supply and installation of street lighting poles (single bracket/double bracket) including built in marshalling box and necessary wire/cable running from marshalling box to the lighting fixture, cable termination and connection, fixing of cable glands and lugs, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1528	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.10	Poles as per std. 7-51-0233 with MB as per 7-51-0208 for safe area	5	nos		33887	169435
1529	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.20	Poles as per std. 7-51-0233 FLP MB for Gas IIA/IIB, Temp Class T3 for hazardous area	175	nos		26564	4648700
1530	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.30	Poles as per std. 7-51-0234 sht. 1 of 2 (Single bracket)	15	nos		24524	367860
1531	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.40	Poles as per std. 7-51-0234 sht. 1 of 2 (Double bracket)	15	nos		36575	548625
1532	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.50	Poles as per std. 7-51-0234 sht. 2 of 2 (Single bracket)	450	nos		39573	17807850
1533	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.60	Poles as per std. 7-51-0234 sht. 2 of 2 (Double bracket)	25	nos		43621	1090525
1534	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.70	Poles as per std. 7-51-0235 sht. 1 of 2	25	nos		42343	1058575
1535	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.70.80	Poles as per std. 7-51-0235 sht. 2 of 2	15	nos		50872	763080
1536	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.80	Supply and installation of G.I. light pole for aviation lights including all civil works, structural steel works, foundation, providing shoring, strutting and de-watering as required and including supply of cement, steel, GI pipes, base plates, adaptors, reducers, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1537	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.80.10	Poles as per std. 7-51-0220 Detail-1	5	nos		10702	53510
1538	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3020.80.20	Poles as per std. 7-51-0220 Detail-2	5	nos		9600	48000
1539	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030	HAZARDOUS AREA LIGHTING FIXTURES AND ACCESSORIES					
1540	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10	Installation, connection, testing and commissioning of following types of flame proof/Div.2 lighting fixtures and accessories, including cable termination and connection, fixing of cable glands, lugs, including supply of necessary hardwares, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1541	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.10	Well glass type pole mounting type for Ground Level.	80	nos		670	53600
1542	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.20	Well glass type pole mounting type for Platform.	230	nos		670	154100
1543	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.30	Well glass type bracket mounted.	20	nos		670	13400
1544	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.40	Well glass type ceiling mounted.	50	nos		670	33500
1545	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.50	Bulk head type, column/ceiling mounted.	20	nos		670	13400
1546	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.60	Flood light fixtures.	30	nos		1195	35850
1547	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.70	3-way, junction box.	75	nos		536	40200
1548	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.80	4-way, junction box.	5	nos		670	3350
1549	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.10.100	FLP double obstruction aviation fixture.	5	nos		3935	19675
1550	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20	Supply of following FLP/Div.2 lighting fixtures complete with lamps, requisite FLP cable glands, plugs and necessary control gear as per EIL standard specification No. 6-51-0061, data sheet for lighting fixture schedule, including all albour and materials, specifications of this tender and directions of Engineer-in-Charge.					
1551	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB15	Type FLP LED-1 Fixture IIA/IIB (60-65 W) & accessories complete with LED lamp.	2	nos		5083	10166
1552	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB16	Type FLP LED-2 Fixture IIA/IIB (100-105 W) & accessories complete with LED lamp.	2	nos		8111	16222
1553	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB17	Type FLP LED-3 Fixture IIA/IIB (150-155 W) & accessories complete with LED lamp.	2	nos		8760	17520
1554	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB18	Type FLP LED-FD2 Fixture IIA/IIB (100-105 W) & accessories complete with LED lamp.	2	nos		12167	24334
1555	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB19	Type FLP LED-FD3 Fixture IIA/IIB (150-155 W) & accessories complete with LED lamp.	2	nos		16969	33938
1556	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB20	Type FLP LED-DC Fixture IIA/IIB (40-45 W) & accessories complete with LED lamp.	1	nos		4835	4835
1557	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB21	Type FLP LED-AV Fixture IIA/IIB & accessories complete with LED lamp.	1	nos		13390	13390
1558	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB22	Type FLP LED-1 Fixture IIC (60-65 W) & accessories complete with LED lamp.	1	nos		5337	5337
1559	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB23	Type FLP LED-2 Fixture IIC (100-105 W) & accessories complete with LED lamp.	1	nos		8517	8517
1560	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB24	Type FLP LED-3 Fixture IIC (150-155 W) & accessories complete with LED lamp.	1	nos		9199	9199
1561	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB25	Type FLP LED-FD2 Fixture IIC (100-105 W) & accessories complete with LED lamp.	1	nos		12776	12776
1562	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB26	Type FLP LED-FD3 Fixture IIC (150-155 W) & accessories complete with LED lamp.	1	nos		17818	17818
1563	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB27	Type FLP LED-DC Fixture IIC (40-45 W) & accessories complete with LED lamp.	1	nos		5077	5077
1564	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.20.MB28	Type FLP LED-AV Fixture IIC & accessories complete with LED lamp.	1	nos		14060	14060
1565	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.30	Supply and installation of Type-`A' clamps(for bracket mounted lighting fixtures) including bolt (MOC SS304) for fixing the fixture to the clamp as per EIL std.no.7-51-0221, including supply and fixing of anchor fasteners, nuts and bolts, washers etc. as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	15	nos		1009	15135
1566	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.40	Supply and installation of Type-`B' clamps(for ceiling mounted lighting fixtures) including bolt (MOC SS304) for fixing the fixture to the clamps per EIL std.no.7-51-0221, including supply and fixing of anchor fastners,nuts and bolts,washers as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	45	nos		1009	45405
1567	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3030.50	Supply and installation of adapters for Platform and ground pole mounted lighting fixtures as per EIL std.no.7-51-0221, approved drawings, specifications of this tender and directions of Engineer-in-Charge.	315	nos		690	217350

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1568	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040	SAFE AREA LIGHTING FIXTURES					
1569	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20	Supply, installation, testing and commissioning of following energy efficient lighting fixtures and connecting to wiring junction box/marshalling box complete with lamps and necessary control gear including supply of all connected materials like flexible conduit, clamps, supports, chains, anchor fastners, bolts, nuts and washers etc. as required, including supply and fixing of cable glands, lugs, including all labour and materials, as per approved drawings, data sheet for lighting fixture schedule, EIL installation standards, specifications of this tender and directions of Engineer-in-Charge.					
1570	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.200	Type LED 1 Fixtures.	5	nos		6788	33940
1571	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.210	Type LED 2 Fixtures.	5	nos		6788	33940
1572	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.220	Type LED 3 Fixtures.	5	nos		2039	10195
1573	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.230	Type LED 4 Fixtures.	5	nos		3234	16170
1574	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.240	Type LED 5 Fixtures.	5	nos		7086	35430
1575	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.250	Type LED 6 Fixtures.	5	nos		2369	11845
1576	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.260	Type LED 7 Fixtures.	5	nos		2369	11845
1577	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.270	Type LED 8 Fixtures.	5	nos		1730	8650
1578	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.280	Type LED 9 Fixtures.	5	nos		10300	51500
1579	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.350	Type LED IND-1 Fixtures.	5	nos		886	4430
1580	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.360	Type LED IND-2 Fixtures.	5	nos		1092	5460
1581	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.370	Type LED IND-3 Fixtures.	5	nos		5840	29200
1582	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.380	Type LED IND-4 Fixtures.	5	nos		1092	5460
1583	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.450	Type LED RSD-10 Fixtures.	5	nos		2596	12980
1584	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.460	Type LED SFD-12 Fixtures.	5	nos		2596	12980
1585	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.470	Type LED LB-1 Fixtures.	5	nos		18921	94605
1586	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.480	Type LED HB-1 Fixtures.	5	nos		23669	118345
1587	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.490	Type LED HB-2 Fixtures.	5	nos		24751	123755
1588	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.500	Type LED BK-1 Fixtures.	5	nos		1504	7520
1589	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.510	Type LED BK-2 Fixtures.	5	nos		1864	9320
1590	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.520	Type LED BK-3 Fixtures.	5	nos		9692	48460
1591	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.530	Type LED BK-4 Fixtures.	60	nos		12360	741600
1592	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.550	Type LED ST-4 Fixtures.	5	nos		13009	65045
1593	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.560	Type LED ST-10 Fixtures.	5	nos		14502	72510
1594	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.MB560	Dimmable type LED ST-10 Fixture with analog dimmable driver along with dimmer controller and associated cabling between driver & controller	450	nos		16946	7625700
1595	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.570	Type LED ST-11 Fixtures.	5	nos		20858	104290
1596	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.580	Type LED FD-1 Fixtures.	5	nos		15996	79980
1597	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.590	Type LED FD-2 Fixtures.	50	nos		25997	1299850
1598	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.600	Type LED FD-3 Fixtures.	5	nos		51716	258580
1599	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.680	Type LED BL-1 Fixtures.	5	nos		7715	38575
1600	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3040.20.690	Type LED BL-2 Fixtures.	5	nos		9270	46350
1601	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050	FANS AND EXHAUST FANS					
1602	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050.10	Supply, installation, connection, testing and commissioning of following types of exhaust fans including supply of all necessary supports etc., including fixing of cable glands, lugs with BEE(Bureau of Energy Efficiency) rating of minimum 3 star including all labour and materials and accessories like mounting frame, fixing bolt, wire guard/louvres etc., as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1603	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050.10.10	300 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos		5294	26470
1604	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050.10.20	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos		7148	35740
1605	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050.10.60	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres suitable for Gas group IIC, temperature class T3.	5	nos		8642	43210
1606	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3050.40	Supply, installation, connection, testing and commissioning of 240 V AC, 1200 mm sweep ceiling fan with regulator (labeled as minimum 3-star by Bureau of Energy Efficiency)including providing clamp/hook in RCC slab, if necessary, providing, fixing, ceiling, rose, wiring, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	5	nos		3451	17255
1607	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070	SOCKETS / RECEPTACLES AND SWITCHES / MCB UNITS					
1608	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase, sockets/receptacles and metallic outlet boxes as described below including supply of all connected materials, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1609	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10.10	6 A, 3 pin flush/ surface mounting sockets/receptacles.	5	nos		649	3245
1610	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10.20	6 A, 3 pin plate type flush/ surface mounting sockets/receptacles.	5	nos		340	1700
1611	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10.30	16/6 A, 6 pin flush / surface mounting sockets/receptacles.	5	nos		876	4380
1612	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10.40	16/6 A, 6 pin plate type flush/ surface mounting sockets/receptacles.	5	nos		536	2680
1613	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.10.60	20 A, 3 pin surface mounted industrial type switch socket with plug and sheet steel painted box.	5	nos		2287	11435

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1614	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase switches/MCB units, including outlet boxes and associated accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1615	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.10	6 A, piano type flush/surface mounted switches.	5	nos		422	2110
1616	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.20	6 A, plate type flush/surface mounted switches.	5	nos		299	1495
1617	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.30	16 A, piano type flush/surface mounted switches.	5	nos		587	2935
1618	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.40	16 A, plate type flush/surface mounted switches.	5	nos		350	1750
1619	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.50	20A, DP MCB unit in moulded case enclosure for window type air conditioner.	5	nos		2503	12515
1620	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.20.60	32A, DP MCB unit in moulded case enclosure for window / split type air conditioner.	5	nos		2565	12825
1621	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.40	Supply, installation, connection, testing and commissioning of following 415 V, TPN, 4-Pole MCB units in moulded case enclosure including outlet boxes and associated accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1622	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.40.10	16A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3224	16120
1623	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.40.20	32A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3317	16585
1624	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3070.40.30	40A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3574	17870
1625	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080	JUNCTION BOXES (OUTDOOR / INDOOR TYPE)					
1626	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080.10	Supply and installation of dust and vermin proof G.I. sheet steel (1.6 mm thick) junction box WP type suitable for outdoor/indoor installation with number of outgoing ways as under, complete with PVC connectors, supply and fixing of cable glands, including supply of required size and number of terminals, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1627	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080.10.10	3 way.	55	nos		2863	157465
1628	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080.10.20	4 way.	5	nos		3152	15760
1629	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080.20	Supply and installation of dust and vermin proof G.I. sheet steel (1.6 mm thick) junction box suitable for indoor installation, complete with 15A, 20 terminals, supply and fixing of cable glands for incoming cable and knock outs for conduit entry for outgoing circuits, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1630	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3080.20.10	Junction box.	5	nos		3430	17150
1631	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090	LIGHTING / POWER PANELS AND DISTRIBUTION BOARDS					
1632	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.10	Supply, installation, connection, testing and commissioning of flame proof weather proof lighting/power panels (for gas group IIA/IIB) as per EIL std. spec. 6-51-0008, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1633	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.10.MB05	40 A, 4 pole incomer MCB isolator and 6 Nos. outgoing double pole MCBs (upto 20 A). Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	2	nos		89929	179858
1634	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.10.MB06	40 A, 4 pole incomer MCB isolator and 12 Nos. outgoing double pole MCBs (upto 20 A) . Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	2	nos		108428	216856
1635	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.10.MB07	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	1	nos		126917	126917
1636	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.20	Supply, installation, connection, testing and commissioning of safe area lighting/power panels, surface/flush mounting type, wall mounting type in dust tight (with hinged cover) sheet steel enclosure having 4 pole incomer and single pole MCB (9 kA type) for outgoing circuit control with complete wiring, including cable termination, connection and fixing of cable glands, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1637	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.20.MB10	40 A, 4 pole incomer MCB isolator and 6 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	5	nos		27429	137145
1638	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.20.MB11	40 A, 4 pole incomer MCB isolator and 12 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	4	nos		43147	172588
1639	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3090.20.MB12	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing single pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	1	nos		59410	59410
1640	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100	WIRING					
1641	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30	Circuit wiring with 660 V grade, (sizes given below), FRLS PVC insulated copper wires in already laid surface/concealed conduit from lighting panel/power panel onwards including the supply of wires, termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1642	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.10	3 Nos x 1.5 sq. mm	50	m		128	6400
1643	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.20	3 Nos x 2.5 sq. mm	50	m		170	8500
1644	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.30	5 Nos x 1.5 sq. mm	50	m		191	9550
1645	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.40	5 Nos x 2.5 sq. mm	50	m		247	12350
1646	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.50	7 Nos x 1.5 sq. mm	50	m		278	13900
1647	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.60	7 Nos x 2.5 sq. mm	50	m		371	18550
1648	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.70	9 Nos x 1.5 sq. mm	100	m		371	37100
1649	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.80	3 Nos x 4 sq. mm	50	m		299	14950
1650	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.30.90	5 Nos x 4 sq. mm	50	m		484	24200
1651	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.50	Circuit wiring in non-hazardous areas using (size given below), copper conductor, XLPE insulated, FRLS outer sleeve cables (third core for earthing) from lighting panel/distribution junction box onwards including the supply of cable, junction boxes and cable glands, including termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1652	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.50.40	3 C x 2.5 sq. mm armoured Cu cables.	100	m		247	24700
1653	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.60	Supply and laying of (surface type) G.I. conduit of following diameter and associated fittings from lighting/ power, telephone, fire alarm/plant communication points etc., including supply ofG.I. sheet steel junction boxes with acrylic cover, pull wire, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1654	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.60.10	25 mm diameter.	50	m		453	22650
1655	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.60.20	40 mm diameter.	50	m		711	35550
1656	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.70	Supply and laying of (surface type) approved make of black enamelled steel conduit of following diameter and associated fittings from lighting/power panel, telephone, fire alarm/plant communication points etc., including supply of G.I. sheet steel junction boxes with acrylic cover, pull wire, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1657	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.70.10	25 mm diameter.	50	m		268	13400
1658	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.70.20	40 mm diameter.	50	m		525	26250
1659	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.80	Supply and installation of 50 mm x 50 mm, (18 SWG) 'METSEC' channel with removable cover, including supply of all connected hardware, supports, all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	100	m		937	93700
1660	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.90	Circuit wiring with 660 V grade (sizes given below) PVC insulated copper conductor wires in already installed metsec channel including the supply of wires, termination, connection and harnessing of wires etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1661	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.90.10	1.5 sq. mm wires.	100	m		64	6400
1662	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.90.20	2.5 sq. mm wires.	100	m		85	8500
1663	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.100	Supply and laying of (concealed type) PVC conduit of following diameter and associated fittings in brick walls, RCC slabs/ceilings for lighting/ power/telephone, fire alarm/plant communication points etc., including supply of G.I. sheet steel junction boxes with acrylic cover, pull wire, making cuts and chasis in built up brick work, RCC slabs/ceilings and making good the same, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1664	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.100.10	25 mm diameter.	25	m		170	4250
1665	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.100.20	40 mm diameter.	25	m		288	7200
1666	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.110	Circuit wiring in non-hazardous areas using (size given below), copper conductor, XLPE insulated, FRLS outer sleeve cables (third core for earthing), from lighting/power panel/distribution junction box, excluding the supply of cable, junction boxes and cable glands but including termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1667	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.110.10	3 C x 2.5 sq. mm	10	m		54	540
1668	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.110.20	3 C x 4 sq. mm	10	m		64	640
1669	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.110.30	4 C x 2.5 sq. mm	10	m		72	720
1670	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.120	Circuit wiring in hazardous areas using (sizes given below) copper conductor, XLPE insulated, FRLS outer sleeve armoured cables (third core for earthing) from lighting/power panel/distribution junction box onwards, excluding the supply of cables, junction boxes and cable glands but including fixing of cable glands, supply and fixing of clamps, cable terminations and connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1671	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.120.10	3 C x 2.5 sq. mm	10	m		74	740
1672	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.120.20	3 C x 4 sq. mm	10	m		85	850
1673	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3100.120.30	4 C x 2.5 sq. mm	10700	m		93	995100
1674	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3120	EMERGENCY LIGHTING					
1675	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3120.10	Supply, installation, connection, testing and commissioning of emergency lighting unit (min. 5W, 100 lumens output) fed by a self- contained battery rated for 2 hours and charger operating on 240 V AC supply, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	2	nos		5243	10486
1676	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3140	SOLAR LIGHTING SYSTEM					
1677	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3140.20	Design, supply, installation, testing and commissioning of hybrid solar photovoltaic street lighting system (SLS) with provision of external power supply from owner's substation complete with pole with built in marshalling box and necessary wire/ cable running from marshalling box to the lighting fixture and battery bank, White LED fixture, PV Module, Battery, including fixing and connection of fixtures, cable termination and connection, fixing of cable glands and lugs and all mounting accessories and hardware as required, including all civil works, excavation, pre-cast foundation, disposal of surplus earth, etc. and including supply of cement, steel, GI pipes and, base plates, paint all other sundry materials, special cables etc. as required for each SLS system, including painting, all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1678	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.3140.20.MB01	Hybrid Solar Photovoltaic Street Lighting System (SLS) comprising of 40 W Dimmable type LED light fixture with analog dimmable driver and dimmable controller, 150 Wp PV Module, 12 V battery of 200 Ah capacity Lead-Acid type and external supply of 240 V with 7 meter high pole with single bracket as per Sheet 1 of 2 of 7-51-0234 and complete with PV module and Battery Box mounting arrangement, Battery box of 18 SWG Sheet Steel, Charge control unit(s) with changeover facility having provision to receive following external alternate supply from Owner with all protection feature including lightning protection and charge indication, all other control electronics, interconnecting wires/cables, etc. All items shall be MNRE approved.	110	nos		105884	11647240
1679	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4010	SOIL RESISTIVITY					
1680	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4010.10	Measurement of soil resistivity in accordance with IS:3043, including all labour and materials, as per approved drawings, specifications of this tender and at locations as per directions of Engineer-in-Charge.	2	nos		17932	35864

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1681	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4020	EARTH ELECTRODES					
1682	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4020.MB11	Supply, installation, testing and commissioning of maintenance free chemical earth pits complete with earth electrode with Cu bonded high tensile low carbon steel core electrode, as per drawing B857-000-16-50-SK-0102 and all necessary materials including excavation of earth pit, filling with maintenance free chemical for ease of operation and maintenance, back filling, providing necessary brick work, connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	370	nos		43466	16082420
1683	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4020.MB21	Supply, installation, testing and commissioning of 150 mm dia. GI earth electrodes medium class duty (earth pit depth up to 60 Mtr. length) with double run 50 x 6 mm tinned copper strip and double run single core 50 sq.mm. multi stranded, green flexible copper cable, both connected at bottom of electrode. (The earth electrode GI pipe should have M16 holes at every 500 mm across length) and all necessary materials including excavation / drilling / boring for the pit, back filling, providing necessary brickwork, connections, including all labour and materials, as per approved drawing no. B933-000-16-50-SK-4002, specifications of this tender and directions	300	m		15450	4635000
1684	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030	EARTH STRIPS					
1685	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10	Supply, installation and connection of following GI earthing strip along the cable trenches or cable trays or fixing to walls or structures including welding at joints, providing anti-corrosive paint or bitumen and jute covering for welded portion, clamping and necessary hardware for connecting, etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1686	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10.10	75 x 10 mm	100	m		865	86500
1687	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10.MB10	100 x 12 mm	1000	m		1133	1133000
1688	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10.20	50 x 6 mm	33400	m		422	14094800
1689	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10.30	40 x 5 mm	7860	m		299	2350140
1690	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.10.40	25 x 3 mm	600	m		180	108000
1691	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20	Supply, installation and connection of following GI earthing strip buried individually at a depth of 500 mm including welding at joints, providing anti-corrosive paint or bitumen and jute covering for welded portion, clamping and necessary hardware for connecting, excavation and refilling etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1692	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20.10	75 x 10 mm	100	m		1009	100900
1693	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20.MB10	100 x 12 mm	200	m		1236	247200
1694	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20.20	50 x 6 mm	38210	m		536	20480560
1695	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20.30	40 x 5 mm	2660	m		422	1122520
1696	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4030.20.40	25 x 3 mm	700	m		299	209300
1697	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040	EARTHING CONNECTION					
1698	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.10	Connecting individual equipment to the earth strip or earth plate with following sizes of G.I. wire / G.I. wire rope including the supply of G.I. wire /G.I. wire rope, lugs, conductors, connecting to the G.I. strip or earth plate and necessary hardware for connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1699	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.10.10	3/8" dia (10 mm) flexible rope.	4010	m		227	910270
1700	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.10.20	5/8" dia (16 mm) flexible rope.	1710	m		381	651510
1701	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.10.30	8 SWG GI Wire.	1230	m		64	78720
1702	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.20	Supply and installation of 5 m long, 25 sq. mm (168/0.01772") insulated single core copper flexible conductor with crimped type lug at one end and approved crocodile clip at other end, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1703	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.20.10	5 m long, 25 sq. mm (168/0.01772") insulated single core Cu flexible conductor.	5	nos		2884	14420
1704	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.30	Supply and installation of 25 sq. mm (168/0.01772") copper flexibles of following length with copper lugs crimped on both sides for earthing of pipeline vessels, equipments (non electrical) as per std. 7- 51-0112, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1705	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.30.10	300 mm	50	nos		649	32450
1706	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.30.20	500 mm	100	nos		762	76200
1707	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4040.30.30	1500 mm	20	nos		1391	27820
1708	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4050	EARTH PLATES					
1709	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4050.10	Supply, installation and connection of GI earth plates as per std. 7-51-0103, complete with anchor bolts, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1710	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4050.10.10	GI earth plate as per std. 7-51-0103.	415	nos		1689	700935
1711	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4060	CABLES FOR NGR CONNECTION					
1712	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4060.10	Connecting neutral of the transformer/Generator through following single core PVC/XLPE insulated cable to NGR including supply of Al/Cu conductor, PVC/XLPE insulated, unarmoured and PVC sheathed cables, clamps, necessary supports, all hardware, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1713	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4060.10.30V1	6.6 kV 185 mm² XLPE insulated Aluminium conductor cable for NGR connection	40	m		1833	73320
1714	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4070	EARTHING CONNECTORS					
1715	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4070.10	Supply and installation of MS ear of width 50 mm and thickness 5 mm for earthing of process vessels, steel structures, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1716	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4070.10.10	Minimum 75mm to maximum 300 mm long	10	nos		1102	11020
1717	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4100	EARTHING CABLES					
1718	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4100.30	Supply of 1100 V grade, multi stranded Copper Conductor, XLPE/PVC insulated and unarmoured cables (with green/yellow strips or green colour outer sleeve) of following sizes as per EIL standard specification No. 6-51-0051, data sheet, specifications of this tender and directions of Engineer-in-Charge.					
1719	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4100.30.90	1 C x 185 Sqmm	250	m		2863	715750
1720	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4100.40	Termination & connection of leads of 1100 V grade, multi stranded Copper Conductor, XLPE/PVC insulated and unarmoured, cables of following sizes for earthing of equipment, including supply of lugs, supply and fixing of GI saddles and saddle bars, cutting and stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable, including all labour and materials as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1721	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.4100.40.90	1 C x 185 Sqmm	10	nos		2925	29250
1722	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010	PLANT COMMUNICATION SYSTEM					
1723	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10	Installation, termination, connection, testing and commissioning of following plant communication system (including back up battery bank, battery charger etc.), including transportation from store/yard to site at the place of installation, assembling and installing in foundation or fixing to wall/structure, aligning, levelling, grouting, cable termination, wiring and all inter-connection and making earth connection etc., first charging of battery, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1724	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.10	Central Exchange Panel along with associated battery, battery charger.	1	nos		21300	21300
1725	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.20	Desk type intercom station upto 24 keys.	5	nos		3760	18800
1726	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.MB20	Desk type intercom station above 54 keys.	1	nos		5150	5150
1727	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.30	Desk type intercom station with above 24 and upto 54 Keys.	1	nos		4275	4275
1728	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.40	Weather Proof Intercom station with upto 3 Nos dual position Keys (FLP/Industrial type)	50	nos		1370	68500
1729	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.50	Weather proof loudspeakers (FLP/Industrial Type).	10	nos		1205	12050
1730	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.60	Loud speakers with amplifier (FLP/industrial type).	50	nos		1710	85500
1731	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.90	Beacon Lamps (FLP/industrial type).	10	nos		5438	54380
1732	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.10.100	Acoustic hood (FLP/industrial type).	10	nos		2184	21840
1733	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.40	Supply of weatherproof type plant communication junction box (PAJB) suitable for outdoor installation with Krone/screw type terminals, including supply of weatherproof double compression cable glands and weatherproof plugs to block the unused entry including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1734	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.40.10V1	PAJB with 1 nos 10 Pair incoming cable(s) and 2 nos 5 Pair outgoing cable(s)	1	nos		26667	26667
1735	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.40.10V3	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos		34124	34124
1736	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.40.10V4	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	2	nos		37523	75046
1737	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.40.10V12	PAJB with 1 nos 100 Pair incoming cable(s) and 20 nos 5 Pair outgoing cable(s)	1	nos		41200	41200
1738	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.50	Installation, testing and commissioning of weatherproof type plant communication junction box (PAJB) suitable for outdoor installation with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly cable, excluding supply of weatherproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1739	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.50.10V2	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos		3245	3245
1740	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.50.10V3	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	2	nos		5840	11680
1741	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.50.10V6	PAJB with 1 nos 100 Pair incoming cable(s) and 20 nos 5 Pair outgoing cable(s)	1	nos		7560	7560
1742	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.50.10V13	PAJB with 1 nos 10 Pair incoming cable(s) and 2 nos 5 Pair outgoing cable(s)	1	nos		3121	3121
1743	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.70	Installation, testing and commissioning of flameproof and weatherproof type plant communication junction box (PAJB) suitable for gas group IIA/IIB or IIC, temperature class T3 with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly filled cables, excluding supply of flameproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1744	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.70.10V5	PAJB with 1 nos 100 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos		14399	14399
1745	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.70.10V6	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	5	nos		8570	42850
1746	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.70.10V9	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos		9548	9548
1747	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5010.70.10V15	PAJB with 1 nos 30 Pair incoming cable(s) and 6 nos 5 Pair outgoing cable(s)	2	nos		8343	16686
1748	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5020	TELEPHONE SYSTEM					
1749	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5020.60	Supply of weatherproof type telephone system junction box (TDJB) suitable for outdoor installation with Krone/screw type terminals, including supply of weatherproof double compression cable glands and weatherproof plugs to block the unused entry including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1750	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5020.60.10V1	Weather proof TDJB with 1 nos 20 Pair incoming cable(s) and 20 nos 1 Pair outgoing cable(s)	2	nos		16017	32034
1751	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030	FIRE ALARM SYSTEM					
1752	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20	Installation, termination and connection of following fire alarm panel including Power Pack and battery backup system and all associated items, including transportation from store/yard to site at the place of installation, assembling and installation on foundation or fixing to wall or steel structures, aligning, levelling, grouting, termination and connection of cables, making earth connections etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1753	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.10	Fire alarm panel.	2	nos		19446	38892

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1754	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.20	Zonal/Repeat fire alarm panels.	2	nos		19446	38892
1755	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.50	Heat detectors.	2	nos		536	1072
1756	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.80	Linear beam detectors.	2	nos		1607	3214
1757	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.100	Break glass type fire alarm boxes.	350	nos		1195	418250
1758	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.120	Exit signs.	10	nos		742	7420
1759	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.140	Hooters.	5	nos		742	3710
1760	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.150	Sirens with starters.	5	nos		1195	5975
1761	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.160	Multi sensor type detectors	5	nos		896	4480
1762	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.170	Fault Isolator modules	5	nos		886	4430
1763	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.180	Input/Monitoring relay module	5	nos		1607	8035
1764	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.190	Output/Control Relay Module	5	nos		1607	8035
1765	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.20.200	Hooter Acknowledge Box	5	nos		1360	6800
1766	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.40	Installation, testing and commissioning of weatherproof type fire alarm junction box (FAJB) suitable for outdoor installation with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly cable, excluding supply of weatherproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1767	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.40.10V16	FAJB with 1 nos 6 Pair incoming cable(s) and 6 nos 1 Pair outgoing cable(s)	1	nos		3409	3409
1768	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.60	Installation, testing and commissioning of flameproof and weatherproof type fire alarm junction box (FAJB) suitable for gas group IIA/IIB or IIC, temperature class T3 with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly filled cables, excluding supply of flameproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
1769	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5030.60.10V4	FAJB with 1 nos 6 Pair incoming cable(s) and 6 nos 1 Pair outgoing cable(s)	1	nos		3893	3893
1770	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040	LAYING OF COMMUNICATION / FIRE ALARM CABLES					
1771	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.10	Horizontal and vertical laying/pulling through of communication/fire alarm cables of the following overall diameters in ready trays/trenches/conduits or supported on structures including supplying and fixing of GI saddle and saddle bars, stainless steel strip number tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1772	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.10.10	Cables of overall dia. upto 35 mm.	25000	m		43	1075000
1773	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.10.20	Cables of overall dia. above 35 mm.	2000	m		54	108000
1774	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.20	Laying of HDPE ducts for laying of optical fiber cables between various substations, pulling through pipes or supported on structures including supplying and fixing of GI saddle and saddle bars, including supply and fixing of printed stainless steel/ non magnetic non corrosive metal tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1775	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.20.10	HDPE duct with overall dia. Upto 60mm	104000	m		87	9048000
1776	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.30	Laying of optical fiber cables between various buildings in already laid HDPE conduits for plant communication and fire alarm data highway, feeder differential protection, etc., including supply of all hardware, splice connectors, accessories, pulling through pipes or supported on structures including supply and fixing of printed stainless steel/ non magnetic non corrosive metal tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1777	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5040.30.10	Cables of overall dia. upto 40 mm.	104000	m		75	7800000
1778	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050	STRAIGHT THROUGH JOINTS COMMUNICATION / FIRE ALARM CABLES					
1779	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050.10	Making of straight through joints for polyethylene insulated armoured jelly filled/ non filled overall PVC jacketed, including supply of all necessary materials for the joint, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1780	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050.10.40V1	For Non-Jelly filled cables of size 2.5 mm² 2 pair	5	nos		690	3450
1781	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050.10.40V2	For Non-Jelly filled cables of size 2.5 mm² 4 pair	5	nos		989	4945
1782	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050.10.40V3	For Non-Jelly filled cables of size 2.5 mm² 6 pair	5	nos		1277	6385
1783	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5050.10.40V4	For Non-Jelly filled cables of size 2.5 mm² 12 pair	5	nos		2338	11690
1784	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060	END TERMINATIONS FOR COMMUNICATION/ FIRE ALARM CABLES.					
1785	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20	Supply ,Installation, testing and commissioning of Fiber Optic Patch panel (LIU) for following type & number of fiber for OFCs including all accessories for terminating, pigtails with Connectors, patch cords with connectors, Splicing sleeves and splice tray including all labour and materials as per approved drawings specifications of this tender and directions of engineer-in-Charge					
1786	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V1	For 6 fiber Mono mode cable with LC pigtails and LC patch cords	10	nos		37760	377600
1787	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V3	For 6 fiber Mono mode cable with SC pigtails and LC patch cords	10	nos		37760	377600
1788	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V4	For 6 fiber Mono mode cable with ST pigtails and LC patch cords	10	nos		37760	377600
1789	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V5	For 6 fiber Mono mode cable with LC pigtails and SC patch cords	10	nos		37760	377600
1790	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V6	For 6 fiber Mono mode cable with LC pigtails and ST patch cords	10	nos		37760	377600
1791	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V7	For 6 fiber Mono mode cable with SC pigtails and SC patch cords	10	nos		37760	377600
1792	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V8	For 6 fiber Mono mode cable with SC pigtails and ST patch cords	10	nos		37760	377600

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1793	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V9	For 6 fiber Mono mode cable with ST pigtails and SC patch cords	10	nos		37760	377600
1794	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.20.10V10	For 6 fiber Mono mode cable with ST pigtails and ST patch cords	10	nos		37760	377600
1795	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.30	Termination of optical fiber cables for various systems including supply of all hardware, splice connectors, accessories, including all labour and materials as per approved drawings specifications of this tender and directions of engineer-in-Charge					
1796	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5060.30.10	6 Fiber	100	nos		4954	495400
1797	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5070	SUPPLY OF COMMUNICATION / FIRE ALALRM CABLE / CONDUITS / DUCTS					
1798	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5070.20	Supply of Mono mode, jelly filled, Optical fiber cable with non metallic armour with following number of cores & construction, as per EIL standard specifications, data sheet, specifications of this tender and directions of Engineer-in-Charge.					
1799	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5070.20.50	6 Fiber unitube construction	82000	m		139	11398000
1800	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5070.40	Supply of HDPE ducts for laying of optical fiber cables between various substations, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
1801	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.5070.40.10	HDPE duct with overall dia. Upto 60mm	82000	m		214	17548000
1802	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010	CIVIL WORKS/M.S. CHEQUERED PLATE					
1803	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.10	Excavation and backfilling of trenches for cables and earth strip etc. , for a maximum depth of 1.5 m, shoring, shuttering and dewatering (if necessary) including consolidation and disposal of surplus earth up to a distance of 30 m, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excavated trench dimensions shall be measured).					
1804	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.10.10	Excavation and backfilling of trenches in all types of soil except rock.	22500	m^3		711	15997500
1805	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.10.20	Excavation and backfilling of trenches in all types of soil including rock.	2500	m^3		1257	3142500
1806	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.20	Supply and laying of 40 mm size gravel in one layer of 100/150 mm thick including dressing of soil surface and laying the aggregate in uniform layer and density, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge (Aggregate will be measured in boxes of size 1.5 m x 1.5 m x 0.5 m which shall be taken as 1 cubic metre, the boxes are to be furnished by the contractor free of cost for measuring purposes).					
1807	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.20.10	40 mm size gravel.	100	m^3		1803	180300
1808	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.30	Supply and spreading of approved fine river sand/stone dust in cable trenches, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge.					
1809	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.30.10	Fine river sand.	25	m^3		3440	86000
1810	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.30.20	Stone dust grading Zone-II, grading limits as per IS-383.	10000	m^3		1761	17610000
1811	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.MB40	Supply and spreading of approved CLAY BRICKS - TYPE-5 of 75 mm thickness in cable trenches for cable protection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Actual area of laid brick surfaces shall be measured).					
1812	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.MB40.01	Bricks	575	m^2		464	266800
1813	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.50	Providing and laying plain cement concrete for all depths below and up to a plinth level in foundations including tamping, ramming, vibrating, curing, shuttering etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed, including supply of all materials and all complete for concrete of M-15 grade with 20 mm and down size graded crushed stone aggregates, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1814	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.50.10	Plain cement concrete.	5	m^3		7014	35070
1815	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.60	Supply, fabrication and installation of 6 mm thick M.S. chequered plate for covering floor cut- outs/cable trenches etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1816	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.60.10	6 mm thick M.S. chequered plate.	1055	m^2		6252	6595860
1817	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.70	Supply and installation of fire proof sealing system as per IEC-60332 including supply and fabrication of steel frames and other accessories (cement, gravel, sand etc.) including drilling, cutting, welding, surface preparation, dressing/ chipping of concrete, enlargement etc. including all minor masonry and structural works and repair of all damages in line with the enclosed job specification and instructions of the Engineer-in-Charge	150	m^3		53931	8089650
1818	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.80	Making through and through cut outs in pockets of size 150 mm dia in the RCC floor/walls of trenches/buildings of thickness upto 200mm for facilitation cable entries using concrete cutting machines including all labour and materials as per approved drawings, specifications of this tender and directions of Engineer -in-charge	5	nos		1576	7880
1819	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.90	Making through and through cut outs in pockets of following shape and size in the RCC floor/ walls of trenches/ buildings of thickness above 200 mm and upto 400 mm for facilitating cable/ duct entries, using concrete cutting machines and making cut out good using plastering and painting including all material and labour as per approved drawings, specification of this tender and directions of Engineer-in-charge.					
1820	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.90.10V1	Circular Cut Out of diameter 150 mm	2	nos		3214	6428
1821	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.90.20V1	Rectangular Cut Out of length 200 mm width 200 mm	2	nos		4285	8570
1822	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.6010.90.20V2	Rectangular Cut Out of length 300 mm width 300 mm	2	nos		5356	10712
1823	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010	LAN SYSTEMS					
1824	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.10	Supply, installation, connection, testing and commissioning of weatherproof power panels for UPS power distribution having following incomer & outgoing feeders, including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer-in-charge.					
1825	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.10.10	32A, double pole incomer MCB isolator and 6 nos outgoing double pole 10A MCBs isolator with 2nos, 10A semiconducting fuses.	2	nos		13339	26678
1826	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.10.20	32A, double pole incomer MCB isolator and 12 nos outgoing double pole 10A MCBs isolator with 2 nos, 10A semiconducting fuses ,	2	nos		16810	33620
1827	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.10.30	63A, double pole incomer MCB isolator and 18 nos outgoing double pole 10A MCBs isolator with 2 nos, 10A semiconducting fuses	2	nos		19137	38274

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1828	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.20	Supply, installation, termination, testing and commissioning of flush mounted CAT-6 UTP JACK (Information Outlets) including supply of all connected materials(i.e Face plates, Surface mount box, patch cord at I/O end), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge.	2	nos		711	1422
1829	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.30	Circuit wiring with following cables for LAN in already laid surface/concealed conduit from Etherswitch rack onwards to Cat-6 UTP Jack (Information outlet) including the supply of cables, termination and connection at both ends (i.e at jack panel end & at the I/O end), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge.					
1830	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.30.10	1 no. CAT-6 UTP cable	50	m		75	3750
1831	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.30.20	2 nos. CAT-6 UTP cable	50	m		129	6450
1832	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.30.30	3 nos. CAT-6 UTP cable	50	m		204	10200
1833	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.50	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase, sockets/receptacles/switches as described below including all connected materials, outlet boxes and associated accessories including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
1834	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.50.10	3 Nos 6 A, 3 pin flush/ surface mounting sockets/receptacles with 1 Nos 16 A, piano type flush/surface mounted switches.	5	nos		2493	12465
1835	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.8010.50.20	3 nos 6 A, 3 pin plate type flush/ surface mounting sockets/receptacles with 1 Nos 16 A, plate type flush/surface mounted switches.	5	nos		1380	6900
1836	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000	PAINTING & MARKING					
1837	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.10	Letter painting and marking of all buses of switchboards, all incomers, bus couplers, outgoings with details of Tag No, feeder rating in KW/Amp, sending end source, in the front of the panels and bus bar, panel nos.etc. on the rear side of the panels for all switchboards, all other substation equipment viz.transformers, capacitors, neutral grounding resistors, VFD panels, other panels, etc for equipment housed in electrical substations including supply of all material such as stickers, enamel paints, stencil, etc including supply of all labour, materials as per the specification of this tender and directions of Engineer-in-Charge.					
1838	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.10.10	Each alphabet/character upto 2 inch in height/length	7000	nos		54	378000
1839	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.10.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	24000	nos		64	1536000
1840	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.10.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	16000	nos		74	1184000
1841	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.10.40	Each alphabet/character above 8 inch and Upto 12 inch in height/length	1500	nos		85	127500
1842	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.20	Letter painting of tag nos., applicable circuit nos. for identification with red/black/white paint for all outdoor equipment in safe and hazardous areas viz. light fittings, control gear boxes, lighting/power panels, welding receptacles, convenience receptacles, local control stations, fire alarm manual call points, fire alarm detectors, motors, field call stations, loud speakers, etc. including supply of enamel paint, all hardware as required, supply of all labour, materials as per the specification of this tender and directions of Engineer-in-Charge.					
1843	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.20.10	Each alphabet/character upto 2 inch in height/length	7500	nos		74	555000
1844	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.20.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	9000	nos		85	765000
1845	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.20.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	5000	nos		96	480000
1846	A	B957-999-16-50-PK-SOR-9501-A-2M	01EE.9000.20.40	Each alphabet/character above 8 inch and Upto 12 inch in height/length	1000	nos		106	106000
1847	A	B957-999-16-51-PK-SOR-9501-A-2M	01II	INSTRUMENTATION					
1848	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10	PRESSURE GAUGES AND ACCESSORIES (Excl. supply of Impulse pipe/Tubing materials)					
1849	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10	Installation of Line mounted or Remote mounted or Local Gauge Board mounted Pressure gauge/ Pressure gauge with Pulsation Dampener/ Syphon/ Over-range Protector (direct/ surface mounted/ diaphragm seal type) inclusive of mounting of instrument, supply and erection of supports/tray, mounting on support (if support required) , laying of capillary on tray, fabrication and installation of manifolds/ impulse lines with supports as per standards indicated below, hydraulic testing and painting of supports but exclusive of Supply of Instrument, Gauge Board, Yoke, Piping material and Calibration.					
1850	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V5	In Stainless Steel as per Standard 7-52-0432/1112	13	nos		4380	56940
1851	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V6	In Carbon Steel as per Standard 7-52-0432/1112	133	nos		4220	561260
1852	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V9	In Alloy Steel as per Standard 7-52-0433/1113	5	nos		4560	22800
1853	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V12	In Carbon Steel as per Standard 7-52-0433/1113	14	nos		4220	59080
1854	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V25	In Carbon Steel as per Standard 7-52-1210	8	nos		5230	41840
1855	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.1V58	In Carbon Steel as per Standard 7-52-2126	63	nos		11220	706860
1856	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.10.10.MC01	In Stainless Steel as per Standard 7-52-2126	2	nos		11530	23060
1857	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30	PRESSURE INSTRUMENTS (Excl. supply Impulse pipe/Tubing materials)					
1858	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10	Installation of Pressure Transmitters/ Pressure Switches (with or without Pulsation Dampener, Over-range Protector)/ Diaphragm seal type Pressure Transmitters/ Diaphragm seal type Pressure Switches including mounting on Yoke/ Surface, supply of supports for capillary, supply and erection of supports for impulse lines wherever required, fabrication and installation of manifolds/ impulse lines with supports as per Standard indicated below, laying of capillary on supports, hydraulic testing and painting of supports but exclusive of Supply of Instrument, Piping/tubing materials, all Electrical/ Pneumatic connections, Yoke and Calibration.					
1859	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.1V30	In Carbon Steel as per Standard 7-52-1143	95	nos		3090	293550
1860	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.1V50	In Stainless Steel as per Standard 7-52-1143	11	nos		3090	33990
1861	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.1V86	In Carbon Steel as per Standard 7-52-2110	10	nos		11120	111200
1862	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.1V117	In Alloy Steel as per Standard 7-52-1202	5	nos		19160	95800
1863	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.MC01	In Carbon Steel as per Standard 7-52-1202	2	nos		18440	36880
1864	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.30.10.MC03	In Carbon Steel as per Standard 7-52-1211	16	nos		15860	253760

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1865	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90	DIFFERENTIAL PRESSURE (FLOW) TRANSMITTERS (Excl. supply of Impulse pipe/Tubing material)					
1866	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90.10	Installation of Differential pressure(with or without integral manifold)/ Diaphragm Seal Type Differential Pressure flow instruments including Mounting on Yoke, supply of supports for impulse lines/ manifolds/ capillary, fabrication and Installation of manifolds/ impulse lines with supports as per Standard indicated below, laying of capillary on supports, hydraulic testing and painting of supports but exclusive of Supply of Instruments, Piping material, all Electrical/ Pneumatic connections, Yoke and Calibration.					
1867	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90.10.MC01	In Alloy Steel as per Standard 7-52-1385	2	nos		54080	108160
1868	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90.10.1V20	In Carbon Steel as per Standard 7-52-1305	46	nos		3090	142140
1869	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90.10.1V21	In Stainless Steel as per Standard 7-52-1305	4	nos		3090	12360
1870	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.90.10.1V71	In Stainless Steel as per Standard 7-52-1413	8	nos		36890	295120
1871	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.120	CORIOLIS MASS FLOWMETERS					
1872	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.120.10	Installation of Transmitters/ Preamplifiers on Yoke/ Instrument (if required), including laying and termination of inter connection cables with supports for cables, painting of supports but exclusive of Supply of Instrument, Yoke and Calibration.					
1873	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.120.10.1	Installation of Transmitters/ Preamplifiers for Coriolis Mass Flowmeters	4	nos		7360	29440
1874	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.125	VORTEX FLOWMETERS					
1875	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.125.10	Installation of integral/ remote transmitters/ Preamplifier for Vortex flowmeter on yoke/ instrument including laying and termination of interconnection cables with supports as necessary and painting of supports but exclusive of Supply of Instrument, yoke and Calibration.					
1876	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.125.10.1	Installation of Transmitters/ Preamplifiers for Vortex Flowmeters	2	nos		11910	23820
1877	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.130	MAGNETIC FLOWMETERS					
1878	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.130.10	Installation of Transmitters/ Preamplifier on Yoke/ Instrument (if required) for Magnetic flowmeter including laying and termination of inter connection cables with supports for cables (as required), painting of supports but exclusive of supply of Instrument, Yoke and Calibration.					
1879	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.130.10.1	Installation of Transmitters/ Preamplifiers for Magnetic Flowmeters	4	nos		11910	47640
1880	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.136	ULTRASONIC FLOWMETER					
1881	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.136.10	Installation of Transmitters/ Preamplifiers for ultrasonic flowmeters on yoke/ instrument (if required) including Straight length spool piece with pressure and temperature compensation loop including laying and termination of interconnection cable supports for cables as required, painting of supports but exclusive of supply of instrument, yoke and calibration.					
1882	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.136.10.1	Installation of Transmitters/ Preamplifiers for Ultrasonic Flowmeters	3	nos		6820	20460
1883	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.150	DIFFERENTIAL PRESSURE (LEVEL) TRANSMITTERS (Excl. supply of Impulse pipe/Tubing material)					
1884	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.150.10	Installation of DP type/ Diaphragm Seal DP type Level Instrument including mounting on Yoke, supply of supports for impulse line/ capillary/ manifold, fabrication of manifolds and erection wherever required, laying of capillary on supports, fabrication and installation of impulse lines with support as per Standard indicated below, hydraulic testing and painting of supports but exclusive of Supply of Instrument, Piping material, all Electrical/ Pneumatic connections, Yoke and Calibration.					
1885	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.150.10.1V33	In Carbon Steel as per Standard 7-52-1605	4	nos		37700	150800
1886	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205	MAGNETIC LEVEL GAUGES					
1887	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205.10	Installation of Magnetic Level Gauges on Vessel/ Piping/ Stand pipes with minor modification wherever required, providing intermediate supports wherever necessary fabrication and installation of drain valve/ vent valve assembly as per Standard Nos. indicated below, hydraulic testing of gauge, exclusive of Supply of Instruments, Piping materials and Calibration.					
1888	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205.10.1V1	In Carbon Steel as per Standard 7-52-0484/1520	10	nos		5460	54600
1889	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205.10.1V3	In Stainless Steel as per Standard 7-52-0484/1520	2	nos		5570	11140
1890	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205.10.1V5	In Carbon Steel as per Standard 7-52-1562	2	nos		5460	10920
1891	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.205.10.1V6	In Stainless Steel as per Standard 7-52-1562	2	nos		5570	11140
1892	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260	RADAR LEVEL INSTRUMENTS					
1893	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.10	Installation of radar sensor and antenna, flanged type connection on equipment nozzle/ rail mounting with/without still well, but exclusive of supply of instruments. Installation of electronics units (total system for indication, transmission, marshalling etc. for one tank), including mounting on Yoke, supply of angle tray with supports, fabrication and erection of supports and laying of cable up to instrument/probe with clamps, termination of cables at both ends, but exclusive of supply of Instruments, supply of yokes and Calibration.					
1894	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.10.1	Installation of radar type of level instruments	36	nos		7070	254520
1895	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.20	Installation of SINGLE point/ AVERAGING type RTD on flanged equipment nozzle, all electrical connections but exclusive of Supply of Temperature element, thermowell.					
1896	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.20.2	Averaging type Temperature Element Installation	12	nos		4870	58440
1897	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.30	Installation of tank side indicator/electronic unit (total system for indication/ transmission/marshalling etc., as required for one tank) including mounting on yoke/support, fabrication and erection of supports, laying and termination of interconnecting cable up to instrument/ indicator with clamps, termination of cables at both ends, painting of supports but exclusive of supply of instruments, yoke, cables and calibration.					
1898	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.30.1	Tank Side Indicator	24	nos		4870	116880
1899	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.40	Installation of junction box if necessary, for multidropping including mounting on yoke/support, laying and termination of interconnecting cables between gauge head, temperature element, tankside indicator and interconnecting with other gauges as appliable, in line with mutidropping/cabling recommended by vendor.					
1900	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.40.1	Junction box installation and interconnecting cables	6	nos		3680	22080
1901	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.50	Installation of control electronics cabinet					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1902	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.260.50.1	Installation of control electronics cabinet	2	nos		5150	10300
1903	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.330	TEMPERATURE INSTRUMENTS					
1904	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.330.10	Installation of Temperature Indicators/ Gauges (Filled system/ Bimetallic) RTD/ Thermocouple/ Temperature Switches/ Temperature transmitters with flanged thermowell inclusive of installation of machined/ built-up thermowells on the nozzle and installation of Instruments, Electrical/ Pneumatic connection but exclusive of Supply of Instruments/ Elements/ Thermowell, and Calibration.					
1905	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.330.10.2	Temperature Indicator/ Gauges (Bimetallic Type) with thermowell on flanged wells	73	nos		1190	86870
1906	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.340	TEMPERATURE TRANSMITTERS (REMOTE MOUNTED)					
1907	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.340.10	Thermocouple/ RTD element with thermowell, along with Temperature Transmitter remote mounted. Installation of transmitter including mounting on yoke, fabrication and erection of supports with clamps and laying of extension/RTD cable upto thermocouple, termination of cables at both ends, painting of supports but exclusive of Supply of Instruments, Cable, Yoke and Calibration.					
1908	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.340.10.1	Temperature Transmitter and Thermocouple with flanged well	97	nos		2280	221160
1909	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400	ANALYZERS AND GAS CHROMATOGRAPH					
1910	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.5	Installation of analyzer/ Gas Chromatograph with probe, sampling system, calibration bottles and accessories including interconnecting tubing, cabling between probe, analyzer, sampling system and calibration bottles mounted in pre-installed fabricated analyzer cabinet as applicable, interconnection of all cables and tubes, supply, fabrication and erection of support for tubing/cabling, reinstallation of loose supplied items for the analyzer, but exclusive of Supply of Analyzer and all its accessories, interconnecting Piping/ Tubing materials, Calibration and Testing.					
1911	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.5.14	Turbidity Analyser	4	nos		23320	93280
1912	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.10	Installation of pH Analyzer of submersion type probe/ flow thru type probe/retractable type probe with sampling system consisting of pressure reducing valve, safety valve, needle valve etc. (duly mentioned in a box /plate/ rack), sample cell (Electrode assembly) and preamplifier/ transmitter mounted on Yoke including installation of cell, sampling system, preamplifier/ transmitter, interconnecting tubing and cabling between cell and sampling system/transmitter, interconnection of all cables and tubes/pipes, supply, fabrication and erection of supports impulse line/ interconnecting cables etc. and hydraulic testing, painting of supports but exclusive of Supply of Analyzer and its accessories, all interconnecting Piping/ Tubing, Calibration and Testing.					
1913	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.10.2	pH analyser installation - Flow through type	4	nos		11710	46840
1914	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.15	Installation of Conductivity type Analyzer including sample cell with sampling system, pressure reducing valve, pressure relief valve, needle valve etc., and transmitter/ preamplifier with/ without pre-assembled assembly on yoke/ fabricated each including installation/ assembly of cell, sampling system, preamplifier/ transmitter, interconnecting tubing/ piping and cabling, laying and interconnection of all cables/ tubes/ pipes, fabrication and installation of manifolds/ impulse lines with supports, supply and installation of supports for impulse lines, hydraulic testing of impulse lines, painting of supports but exclusive of Supply of Analyzer and its accessories, all interconnecting Piping/ Tubing materials, all electrical/ Pneumatic connections, yoke/ rack and Calibration.					
1915	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.15.1	Conductivity type Analyser installation	8	nos		11710	93680
1916	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.16	Installation of Water Quality Analyzer including sample cell with sampling system, pressure reducing valve, pressure relief valve, needle valve etc., and transmitter/ preamplifier with/ without pre-assembled assembly on yoke/ fabricated each including installation/ assembly of cell, sampling system, preamplifier/ transmitter, interconnecting tubing/ piping and cabling, laying and interconnection of all cables/ tubes/ pipes, fabrication and installation of manifolds/ impulse lines with supports, supply and installation of supports for impulse lines, hydraulic testing of impulse lines, painting of supports but exclusive of Supply of Analyzer and its accessories, all interconnecting Piping/ Tubing materials, all electrical/ Pneumatic connections, yoke/ rack and Calibration.					
1917	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.400.16.1	Installation of Water Quality Analyzer	12	nos		11710	140520
1918	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.410	ANALYZER CALIBRATION					
1919	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.410.10	Providing necessary support to the analyser vendor/supplier round the clock during calibration, testing and commissioning of analysers listed below including removal of analyser as necessary from the preinstalled location and reinstallation back to its original location providing tools as required, Instrument air/ Nitrogen, any other utility, test report and loop testing as per vendor/ manufacturer recommendation and by engineers in charge except supply of analyser specific test equipment and consumables like calibration samples and gas cylinders.					
1920	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.410.10.51	H2S Analyzer	4	nos		3460	13840
1921	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.410.10.62	Conductivity Analyzer	8	nos		3460	27680
1922	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.410.10.64	Water Quality Analyzer (TOC)	8	nos		3460	27680
1923	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.420	ANALYZER CABINETS					
1924	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.420.10	Installation of prefabricated analyzer cabinets in analyzer room/ field of following sizes including supply, fabrication and installation of base frame grouting and fixing of foundation bolts as necessary, removal and reinstallation of analysers and its accessories like sampling system, racks, air conditioners, vortex cooler, installation of fresh air duct if necessary, connecting all utility lines to the cabinet as required but exclusive of supply of cabinet and analysers, painting of cabinet and calibration.					
1925	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.420.10.10	Volume less than 1m (W) x 1m (D) x 2.5m (H).	5	nos		17510	87550
1926	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.420.10.20	Volume less than 1.5m (W) x 1.5m (D) x 2.5m (H) but more than 1m (W) x 1m (D) x 2.5m (H).	5	nos		23280	116400
1927	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.430	ANALYSER SHELTER					
1928	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.430.20	Unloading of Analyser Systems, material at storage area and transportation of Analyser Shelters of the following sizes from Site Storage area to the Process unit Installation location					
1929	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.430.20.10	Volume equal or less than 3m (W) x 3m (D) x 2.5m (H)	1	nos		20650	20650
1930	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.435	INSTALLATION OF PRE-FABRICATED SKIDS					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1931	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.435.10	INSTALLATION OF SKID MOUNTED PACKAGES(SINGLE/MULTIPLE SKIDS): Handling and transportation of Package consisting single or multiple skids from Owner's storage point to work site/contractor's stores. Assembly of sub-assemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (including supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of inter- connecting piping including some amount of cutting, welding, NDT, hydrotesting/pneumatic testing, wherever required. Purging the line with air/gas as per the instruction of Package supplier (wherever applicable), providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below :					
1932	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.435.10.MC02	Terminal Automation Skids of 10 MT	3	nos		51500	154500
1933	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.440	DETECTOR SYSTEMS					
1934	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.440.14	Installation of Fire and Gas detectors/monitors, beacon lights and hooters including earthing of Fire and Gas detector, supply of supports but exclusive of Supply of Detectors, Yoke and Calibration.					
1935	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.440.14.1	LEL Detectors	116	nos		1830	212280
1936	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.440.14.9	Beacon Lights	10	nos		1500	15000
1937	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.440.14.10	Hooters	10	nos		1500	15000
1938	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.450	MISCELLANEOUS ITEMS AND DEVICES					
1939	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.450.10	Mounting of Miscellaneous instrument items as listed below on Yoke; fabrication and erection of Supports and including installation of instrument items, painting of supports but exclusive of Supply of Instrument items, Piping/ Tubing material / Calibration and supply and erection of Yoke support.					
1940	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.450.10.5	Flame-proof Push Button Station/ Selector Switches /Lamps.	10	nos		1840	18400
1941	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.450.10.33	Speed Sensor/ Transmitter	2	nos		1190	2380
1942	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.450.10.36	Vibration probes/Transmitter	2	nos		2280	4560
1943	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.460	LOCAL PANELS/ CABINETS/ GAUGE BOARDS					
1944	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.460.10	Installation of local panels in field (Pressurized/ Non-pressurized/ Flame-proof) /PLC cabinets/ marshalling cabinets / Radiation Pyrometer monitor / Gas monitor panels/ local gauge board inside control room with or without instruments of following sizes including supply, fabrication, painting and installation of base frames and installation of panel but exclusive of pneumatic/ electrical connections, supplying of local panels/ local gauge boards.					
1945	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.460.10.3	Size < 2200x1000x800 mm > 1000x800x600mm	144	nos		14940	2151360
1946	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.470	PANEL/ RACK ITEMS					
1947	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.470.10	Mounting of miscellaneous instrument items on panels/ racks etc. as listed below including installation of items, fabrication and erection of supports pneumatic/ electrical connections but exclusive of supply of Instrument items, their setting/ Calibration.					
1948	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.470.10.5	Push Buttons, Selector Switches, Lamps, Bypass Switches	10	nos		1190	11900
1949	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500	CALIBRATION/ TESTING					
1950	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.20	Cleaning, adjusting stroke/ positioner, stroke speed checking of Control and On-off (Shutdown) valves. Providing equipments, necessary test jig, Instrument Air, Nitrogen Cylinders, test reports, all consumable and loop testing. Excludes flow calibration					
1951	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.20.10	Control Valves	13	nos		1730	22490
1952	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.20.20	On-off valves (SDV/ ROV)	27	nos		1410	38070
1953	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.20.21	Self Actuated Pressure reducing valves	22	nos		1410	31020
1954	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60	Cleaning, calibration of the instruments listed below including removal of instrument from reinstalled locations like panels, enclosures, racks, field etc., and fixing them back in respective places, providing equipments, necessary test jig, Instrument Air, Nitrogen Cylinders, test reports, all consumable, except for special imported test equipments for electronic instruments to be supplied by owner if available.					
1955	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.1	Pressure gauges	233	nos		680	158440
1956	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.11	Pressure transmitters	134	nos		1080	144720
1957	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.23	Differential Pressure Transmitters for Flow, Level and D.P.	73	nos		1190	86870
1958	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.33	Temperature gauges	73	nos		1190	86870
1959	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.39	Temperature Transmitters	97	nos		1190	115430
1960	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.42	Special Level Instruments/ Guided Wave / Ecclipse type Radar level instruments	21	nos		1730	36330
1961	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.44	Tank Level Instrument (Radar type)	36	nos		1730	62280
1962	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.61	Electronic Local Indicator	16	nos		800	12800
1963	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.60.81	LEL Detectors	116	nos		1190	138040
1964	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.70	Cleaning, checking and functional tests for flowmeters. Providing equipments, necessary test jig, Instrument Air, test reports, all consumable, except for special imported test equipments for electronic instruments to be supplied by owner if available. Excludes flow calibration.					
1965	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.70.13	Coriolis Mass flowmeters	4	nos		3460	13840
1966	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.70.17	Vortex flowmeters	2	nos		3460	6920
1967	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.70.21	Magnetic flowmeters	4	nos		3460	13840
1968	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.500.70.22	Ultrasonic flowmeters	3	nos		3460	10380

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
1969	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510	LOOP CHECKING					
1970	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10	Loop checking (excluding calibration/ testing) of the instruments listed below including verifying the functional performance of all elements comprising the loop, thereby ensuring proper interconnections and operation, with all other specifications inline with clause 4.13 of Standard specification for Erection tender 6-52-0060.					
1971	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.2	Pressure transmitters	194	nos		430	83420
1972	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.5	Differential Pressure Transmitters for Flow, Level and D.P.	93	nos		430	39990
1973	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.10	Temperature Transmitters	117	nos		430	50310
1974	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.12	Special Level Instruments/ Guided Wave / Ecclipse type Radar level instruments	31	nos		430	13330
1975	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.13	Tank Level Instruments (Radar type)	36	nos		430	15480
1976	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.15	Electronic Local Indicator	16	nos		430	6880
1977	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.17	Gas Detectors	116	nos		430	49880
1978	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.24	pH/ Oxygen/ specific gravity analyzers	4	nos		430	1720
1979	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.35	Push Button/Selector Switches/Lamps	60	nos		430	25800
1980	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.36	Annunciator Window	60	nos		430	25800
1981	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.40	Hooter / Beacon	10	nos		430	4300
1982	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.41	Control valve positioner	13	nos		430	5590
1983	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.46	Solenoid Valves	41	nos		430	17630
1984	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.47	Limit Switches	10	nos		430	4300
1985	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.49	MOV - Feedback	136	nos		430	58480
1986	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.10.50	MOV - Command	204	nos		430	87720
1987	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.40	Loop checking (excluding calibration/ testing) of the flowmeters listed below including verifying the functional performance of all elements comprising the loop, thereby ensuring proper interconnections and operation, with all other specifications inline with clause 4.13 of Standard specification for Erection tender 6-52-0060.					
1988	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.40.5	Coriolis Mass flowmeters	4	nos		430	1720
1989	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.40.6	Vortex flowmeters	2	nos		430	860
1990	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.40.7	Magnetic flowmeters	4	nos		430	1720
1991	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.510.40.8	Ultrasonic flowmeters	3	nos		430	1290
1992	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550	SUPPLY ITEMS					
1993	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.20	Supply of Junction boxes of various types and specifications					
1994	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.20.1V2	Junction Box, Weatherproof type for 12 Pair Cable	26	nos		9390	244140
1995	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.20.1V3	Junction Box, Weatherproof type for 3 Way	5	nos		7810	39050
1996	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.20.2V1	Junction Box, Weatherproof + Flameproof (Gas Groups -IIA/IIB) type 3 Way	2	nos		12460	24920
1997	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.20.2V5	Junction Box, Weatherproof + Flameproof (Gas Groups -IIA/IIB) type for 12 Pair Cable	19	nos		14040	266760
1998	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.30	Supply of Cable glands of various types and specifications					
1999	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.30.6V1	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 1/2" NPTM	720	nos		200	144000
2000	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.30.6V2	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 3/4" NPTM	213	nos		250	53250
2001	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.30.6V4	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 1 1/2" NPTM	45	nos		780	35100
2002	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.40	Supply of plugs for cable entries of various types and specifications					
2003	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.40.4V1	Plug, weatherproof + flameproof (Gas Group IIA/IIB) type, SS 304 material, 1/2" NPTM	180	nos		120	21600
2004	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.40.4V3	Plug, weatherproof + flameproof (Gas Group IIA/IIB) type, SS 304 material, 1 1/2" NPTM	45	nos		470	21150
2005	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50	Supply of compression tube fittings in Stainless Steel of various types and specifications					
2006	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V2	Male Connector: Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	430	nos		390	167700
2007	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V3	Male Connector: Material: SS-316 : Size: 1/4" NPTM X 1/2" OD 153 Bar	52	nos		320	16640
2008	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V4	Male Connector: Material: SS-316 : Size: 1/4" NPTM X 1/4" OD 153 Bar	50	nos		120	6000
2009	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V5	Male Connector: Material: SS-316 : Size: 1/2" NPTM X 1/4" OD 153 Bar	50	nos		150	7500
2010	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V75	Female Connector (HC Service): Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	48	nos		410	19680
2011	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.1V76	Male Connector (HC Service): Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	154	nos		360	55440
2012	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.MC01	SS 316 Needle Valve 1/2" NB OD, PRESSURE RATING: 153 BAR	100	nos		150	15000
2013	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.MC02	SS 316 Needle Valve 1/4" NB OD, PRESSURE RATING: 153 BAR	100	nos		140	14000
2014	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.3V1	Tube Union: Material: SS-316 ; Size: 1/2" OD x 1/2" OD 153 Bar	385	nos		320	123200
2015	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.4V1	Tube Cap; Material: SS-316 ; Size : 1/2" OD 153 Bar	80	nos		200	16000
2016	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.4V12	Tube Cap; Material: SS-316 (HC Service) ; Size : 1/2" OD 153 Bar	106	nos		200	21200
2017	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.5	SS 316 Ball Valve 1/2" NB with NPTF ends 41 Bar	200	nos		1560	312000
2018	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.6	6 Way Air Manifold SS316	9	nos		11670	105030
2019	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.50.7	12 Way Air Manifold SS316	5	nos		19480	97400
2020	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.70	Supply of instrument tubes of different types and specifications					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2021	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.70.2V2	SS316L tube 1/2" OD 153 Bar	500	m		280	140000
2022	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.550.70.3V2	SS316L (HC Service) Tube 1/2" OD 153 Bar	270	m		280	75600
2023	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600	JUNCTION BOX INSTALLATION					
2024	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.10	Installation of weatherproof junction boxes including supply, fabrication and installation of supports, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
2025	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.10.1	For cable size 6P x 0.5/1.0/1.5/2.5 mm² / 16 AWG Signal/FF/Alarm/ Control	10	nos		3580	35800
2026	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.10.5	For cable size 12Px0.5/1.0/1.5/2.5 mm² Signal/Alarm/ Control	10	nos		4120	41200
2027	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.11	Installation of weatherproof and/or flameproof junction boxes on free standing support including supply, fabrication and installation of supports along with required ISMC channel and accessories and as per instructions of Site In-charge, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
2028	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.11.1	As per installation drawing 7-52-0106 (A) - three junction box installation bottom entry	10	Set		16270	162700
2029	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.11.2	As per installation drawing 7-52-0106 (B) - two junction box installation bottom entry	15	Set		13490	202350
2030	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.20	Installation of weatherproof and flameproof junction boxes including supply, fabrication and installation of supports, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
2031	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.20.5	For cable size 12P x 0.5/1.0/1.5/2.5 mm²/16 AWG Signal/FF/Alarm/ Control	10	nos		4120	41200
2032	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.20.43	For cable size 8T x 1.5/ 2.5 mm² RTD/ Gas Detector	2	nos		4750	9500
2033	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.52	Installation of all insert blocks, stay plates, unused blocks with cables piece inserted, end packing etc. of Multi Cable Transit within the frame for Cable entry including necessary civil works, welding, supply and installation of additional steel plate for unused portion of cutouts, fixing of frames, pulling cables to blocks and installation of blocks on frames as per manufacturer's recommendation excluding installation of Multi Cable Transit frames on wall					
2034	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.600.52.5	6 + 6 x 10	2	nos		23320	46640
2035	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610	LAYING OF CABLES					
2036	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.10	Laying of instrumentation cables for signal, alarm, shutdown, control and signal cable on ducts, main trays, perforated trays, angle trays, trenches (including opening of cable duct covers if required through IRCs {Instrument Road Crossings}) including clamping, glanding the cables, termination at both ends including shield/ drain/ communication wire, providing and fixing identifying tags and megger testing but exclusive of supply of cables and erection of ducts, main tray, perforated tray/ angle trays and preparation of cable trench.					
2037	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.10.9	Signal/ Alarm/ Control Cables of cable sizes 24C /12P x 1.5/ 2.5 mm²	169150	m		40	6766000
2038	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.10.12	Special armoured serial link MODBUS TCP/IP/RS485 Serial/ cable	16400	m		30	492000
2039	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.30	Laying of thermocouple/ RTD/ LEL Detector/ H2S Detector cables on ducts, main trays, perforated trays, angle trays, trenches (including through IRCs {Instrument Road Crossings}) including opening of cable duct covers if required clamping, glanding the cables, termination at both ends including shield/ drain/communication wire providing and fixing of identifying tags and megger testing but exclusive of supply of multi cables and erection of ducts, main tray, perforated tray/angle tray and preparation of cable trench.					
2040	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.30.41	1 Triad/ Quad x 1.5 mm² RTD/ LEL Cable	174	m		30	5220
2041	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.30.54	8 Triad/ Quad x 2.5 mm² RTD/ LEL Cable	21600	m		40	864000
2042	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.30.55	2 Triad/ Quad x 1.5 mm² RTD/ LEL Cable	150	m		40	6000
2043	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80	Laying of power cables on ducts, main trays, perforated trays, angle trays, trenches (including through IRCs) including opening of cable duct covers if required clamping, glanding the cables, termination at both ends including shield/ drain/ communication wire providing and fixing of identifying tags and megger testing but exclusive of supply of multi cables and erection of ducts, main tray, perforated tray/ angle tray and preparation of cable trench					
2044	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V2	For cable size 2C x 6 mm²	19400	m		30	582000
2045	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V3	For cable size 2C x 10 mm²	69400	m		30	2082000
2046	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V4	For cable size 2C x 120 mm²	8400	m		70	588000
2047	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V5	For cable size 2C x 150 mm²	4800	m		90	432000
2048	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V7	For cable size 2C x 2.5 mm²	6250	m		20	125000
2049	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V10	For cable size 2C x 4 mm²	14200	m		30	426000
2050	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V11	For cable size 2C x 50 mm²	700	m		50	35000
2051	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V12	For cable size 2C x 70 mm²	4900	m		60	294000
2052	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.610.80.1V13	For cable size 2C x 95 mm²	6600	m		60	396000
2053	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.615	Laying of Fibre Optic cables with or without HDPE conduit					
2054	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.615.1	Laying of Fibre Optic / system cables on ducts, main trays, perforated trays, angle trays, trenches (including through Instrument Road Crossing) including opening of cable duct covers if required, clamping, glanding the cables, termination at both ends including shields , providing and fixing of identifying tags and testing but exclusive of supply of fibre Optic/System cables and erection of ducts, main trays, perforated trays,/angle trays and preparation of cable trench.					
2055	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.615.1.1	Laying of FO/system cables of various sizes upto 30mm OD	1000	m		30	30000
2056	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.615.1.4	Optical Fibre Cable Splicing and termination of each Fibre within room at LIU through connectors, OTDR (Optical noise/dB) testing, after looping in loop box, OFC site acceptance testing all complete as per specifications	60	nos		6820	409200

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2057	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.615.1.5	Optical Fibre Cable Splicing and termination of each fibre at field at LIU through connectors, OTDR (Optical noise/dB) testing, after looping in loop box, OFC site acceptance testing all complete as per specifications	60	nos		9090	545400
2058	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.620	TRENCH WORK					
2059	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.620.10	Excavation of trenches for burying the cable, preparation of same for laying of cable, filling with sand, laying of brick, back filling and compacting of the excavated earth as per specifications including supply of sand and bricks and as per cable trench layout and removal of surplus earth as per instructions of Engineer- in-Charge.					
2060	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.620.10.MC02	Trench size 300 mm (W) x 1000 mm (D)	230	m		1950	448500
2061	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.650	EARTHING					
2062	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.650.10	Supply, laying and termination of both ends of earthing cables from earth grid pit to the DCS/ Local panels/ Barrier earth bus bars in trays/ conduits/ trenches as required.					
2063	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.650.10.1	At both ends of earth grid/ Instruments of GI wire (12 AWG) in trays and conduits as required excluding earth-pit preparation and electrode installation.	100	m		50	5000
2064	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.650.10.7	For earthing cable upto 50 mm² size with PVC insulation	100	m		400	40000
2065	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700	PIPING / TUBING / FABRICATION WORK					
2066	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.2	Fabrication and erection of SS Air lines and fittings including supply/ fabrication/ erection of supports, installation of distribution, pneumatic testing and painting of supports but exclusive of supply of pipe and fittings as per standard					
2067	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.2.1	For 1/2" Size	200	m		360	72000
2068	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.2.2	For size 1"	200	m		470	94000
2069	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.7	Erection of SS Air distribution manifold and fittings including supply/ fabrication/ erection of supports, pneumatic testing and painting of supports but exclusive of supply of SS Air distribution manifold and fittings					
2070	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.7.3	Installation of 12-way Air Manifold (1/2") as per Standard 7-52-1904	5	nos		4430	22150
2071	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.7.5	Installation of 6-way Air Manifold (1/2") as per Standard 7-52-1905	9	nos		2640	23760
2072	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.50	Tubing Hook-up of Control valves/ Pneumatic Transmitters etc. with air filter regulator / positioner / solenoid valves / Current to Pneumatic converters etc. as per Standards					
2073	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.50.18	7-52-1906 (Control Valve with positioner)	13	nos		1840	23920
2074	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.700.50.19	7-52-1902 (Control Valve with positioner with SOV)	21	nos		3030	63630
2075	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780	PWHT/ STRESS RELIEF - CARBON STEEL					
2076	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.10	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Gauges installations.					
2077	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		4220	21100
2078	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.30	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Instruments installations.					
2079	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.30.MC01	Installation standard 7-52-1202	5	nos		18440	92200
2080	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.50	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
2081	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.780.50.MC01	Installation standard 7-52-1413	1	nos		36050	36050
2082	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781	PWHT/ STRESS RELIEF - ALLOY STEEL					
2083	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.10	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Gauges installations					
2084	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		4560	22800
2085	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.30	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Instruments installations					
2086	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.30.MC01	Installation standard 7-52-1202	5	nos		19160	95800
2087	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.50	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
2088	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.781.50.MC01	Installation standard 7-52-1413	1	nos		36770	36770
2089	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785	RADIOGRAPHY - CARBON STEEL WELD JOINTS					
2090	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.10	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Gauges					
2091	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		840	4200
2092	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.30	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Instruments installations					
2093	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.30.MC01	Installation standard 7-52-1202	5	nos		9290	46450
2094	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.50	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
2095	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.785.50.13	Installation standard 7-52-1413	1	nos		10140	10140
2096	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786	RADIOGRAPHY - CS SPECIAL, ALLOY STEEL, SS					
2097	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.10	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Gauges installations					
2098	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		4380	21900
2099	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.30	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Instruments installations					
2100	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.30.MC01	Installation standard 7-52-1202	5	nos		19230	96150
2101	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.50	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
2102	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.786.50.MC01	Installation standard 7-52-1413	1	nos		36890	36890
2103	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800	STRUCTURAL					
2104	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.20	Supply, Fabrication and erection of Galvanised Iron duct and its supports as per standard. Duct configurations include Duct Equal Tee, Duct Expander Tee, Duct Reducer Tee, Duct Offset Bend, Duct with Reducer, Vertical Plane Tee, Vertical Plane Elbow, Duct Bridge (jumpover), Sleeves.					
2105	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.20.1V1	Run of Duct 1200mm (W) X 400mm (H)	1870	m		17480	32687600

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2106	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.20.1V2	Run of Duct 400mm (W) X 200mm (H)	1881	m		6990	13148190
2107	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.20.1V5	Run of Duct 800mm (W) X 300mm (H)	1716	m		11660	20008560
2108	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.30	Supply, Fabrication, and Erection of Galvanised Iron angle/channel trays and its supports as per drawing.					
2109	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.30.1	Trays of 50 X 50 X 6mm angle	1600	m		640	1024000
2110	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.45	Supply, fabrication and installation of of Galvanized Iron ladder tray and its supports as per drawing including bends, tees and elbows, fabricated from 75 mm x 75 mm x 6 mm Galvanized Iron Angle with 50 mm (W) x 6 mm thick Galvanized Iron flat including supply and installation of supports and painting of supports as per specifications.					
2111	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.45.1	Run of ladder tray 600mm width	50	m		2320	116000
2112	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.71	Supply and Erection of prefabricated Hot dip Galvanized MS sheets perforated trays and its supports including tees, bends and elbows as per drawing.					
2113	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.71.1V1	Tray of 150mm (W) X 30mm (H)	1150	m		900	1035000
2114	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.71.1V2	Tray of 300mm (W) X 30mm (H)	3350	m		1340	4489000
2115	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.800.71.1V3	Tray of 60mm (W) X 20mm (H)	3020	m		400	1208000
2116	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802	CANOPY FOR INSTRUMENTS AND JUNCTION BOXES					
2117	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.20	Supply of Prefabricated FRP canopies along with mounting accessories for local instruments, Transmitters, Junction Box etc. for mounting on the stanchion and alignment as per standard 7-52-0105					
2118	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.20.1	FRP Canopy (All sides closed) - Field Instruments	268	nos		2870	769160
2119	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.20.3	FRP Canopy (All Side Closed) - Temperature Transmitter and Loop Powered Indicator	113	nos		2870	324310
2120	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.20.4	FRP Canopy For Junction Box - Front Side Open	45	nos		3590	161550
2121	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.20.6	FRP Canopy for RTD / Thermocouple	97	nos		2870	278390
2122	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.26	Erection of Prefabricated FRP canopies for local instruments, Transmitters, Junction Box etc. on the stanchion and alignment as per standard 7-52-0105					
2123	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.26.1	FRP Canopy (All sides closed) - Field Instruments	268	nos		680	182240
2124	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.26.3	FRP Canopy (All Side Closed) - Temperature Transmitter and Loop Powered Indicator	113	nos		680	76840
2125	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.26.4	FRP Canopy For Junction Box - Front Side Open	45	nos		800	36000
2126	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.802.26.6	FRP Canopy for RTD / Thermocouple	97	nos		680	65960
2127	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850	Instrumentation Works					
2128	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850.30	INSTALLATION OF PRE-FABRICATED HOOK-UP ASSEMBLY: Transportation of prefabricated hook-up assemblies from Owner's storage point to work site, connecting of First-joint of prefabricated hook-up on pipe/ equipment nozzles/ orifice assembly/ flow-meter and at pre-fabricated hook-ups assembly end, erection of supports, mounting of instrument stanchions (2" pipe) through pipe clamp/ Brackets (if required), including performing Radiography & PWHT wherever applicable as per the piping class but exclusive of supply pre-fabricated hook-up assembly, instrument stanchions, pipe clamps/ brackets. Prefabricated hook-up welding on pipe shall be of dissimilar material. Material of Pre-fabricated hook-ups shall be SS (316/316L/304/321).					
2129	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850.30.3	Flow assembly with 3/4" SW connection (without PWHT)	50	nos		1730	86500
2130	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850.30.4	Flow assembly with 3/4" SW connection (with PWHT)	10	nos		1950	19500
2131	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850.30.7	Pressure assembly with 1/2" SW connection (without PWHT)	110	nos		1730	190300
2132	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.850.30.8	Pressure assembly with 1/2" SW connection (with PWHT)	10	nos		1950	19500
2133	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900	GENERAL SITE WORK					
2134	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.10	Supply of Yoke supports for transmitters/ preamplifiers (wherever applicable) including supply, fabrication and erection of instrument yoke of all types and painting of yoke supports but exclusive of mounting of Instrument on supports.					
2135	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.10.1	2" Yoke supports as per standard 7-52-0101	420	nos		2720	1142400
2136	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.12	Erection of 2" Yoke supports/ stanchions for Instruments but excluding supply and fabrication of Yoke support.					
2137	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.12.1	Erection of 2" Yoke supports for instruments excluding supply of Yoke	420	nos		1700	714000
2138	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.40	Identification of instrument items wherever required including supply of approved color of paint/ paints (Fluorescent), painting of tag number (approx. 25-50 mm high) on instrument item like transmitters, switches, level gauges, local indicators, control valves, on-off valves, pressure relief valves, self-actuated pressure control valves, junction boxes, local control panels, stanchions etc. as specified by Engineer-in-Charge.					
2139	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.900.40.1	Identification of instrument items	500	nos		350	175000
2140	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950	SITE ACTIVITIES BY MECHANICAL CONTRACTOR					
2141	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10	Transportation of all types of valves (Including Control Valves, Special Control Valves, PRDS, Control valves, On-Off/Shutdown valves, Self actuating valves) from Owner's storage points to contractor's stores/worksite and installation of valves for all rating including assembly of valves accessories like air bottles etc, if any, fixing of gaskets bolts/nuts wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge.					
2142	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V10	Inlet Valve size - 12" , Rating - 300#	2	nos		7290	14580
2143	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V11	Inlet Valve size - 1" , Rating - 300#	2	nos		870	1740
2144	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V12	Inlet Valve size - 1 1/2" , Rating - 300#	2	nos		950	1900
2145	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V13	Inlet Valve size - 3" , Rating - 300#	5	nos		1820	9100
2146	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V14	Inlet Valve size - 2" , Rating - 300#	23	nos		1040	23920
2147	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V15	Inlet Valve size - 4" , Rating - 300#	5	nos		2430	12150

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2148	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V16	Inlet Valve size - 6" , Rating - 300#	4	nos		3650	14600
2149	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V17	Inlet Valve size - 8" , Rating - 300#	4	nos		4860	19440
2150	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V20	Inlet Valve size - 16" , Rating - 300#	1	nos		10300	10300
2151	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V21	Inlet Valve size - 10" , Rating - 600#	3	nos		6080	18240
2152	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V23	Inlet Valve size - 2" , Rating - 600#	2	nos		1040	2080
2153	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V25	Inlet Valve size - 4" , Rating - 600#	1	nos		2430	2430
2154	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V36	Inlet Valve size - 2" , Rating - 1500#	1	nos		1040	1040
2155	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V44	Inlet Valve size - 12" , Rating - 600#	1	nos		7290	7290
2156	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V55	Inlet Valve size - 24" , Rating - 600#	1	nos		16760	16760
2157	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.1V79	Inlet Valve size - 20" , Rating - 600#	1	nos		13460	13460
2158	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.MC01	Inlet Valve size - 10" , Rating - 1500#	1	nos		6080	6080
2159	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.MC02	Inlet Valve size - 12" , Rating - 1500#	1	nos		7290	7290
2160	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.10.MC03	Inlet Valve size - 18" , Rating - 1500#	1	nos		11870	11870
2161	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11	Transportation of all types of Safety Valves, Pilot Operated Safety Valves, Breather valves from owner's storage point to contractor's store/worksite and installation of valves for all ratings including assembly of valves, accessories if any, at all locations and fixing of gaskets, bolts/nuts wherever required as per drawings, specifications and as per the directions of engineer-in-charge.					
2162	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V1	Inlet size - 1 1/2" , Rating - 150#	2	nos		920	1840
2163	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V2	Inlet size - 8" , Rating - 150#	2	nos		4860	9720
2164	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V3	Inlet size - 1" , Rating - 150#	50	nos		610	30500
2165	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V7	Inlet size - 6" , Rating - 150#	2	nos		3650	7300
2166	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V9	Inlet size - 1" , Rating - 300#	10	nos		610	6100
2167	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V10	Inlet size - 1 1/2" , Rating - 300#	2	nos		920	1840
2168	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V17	Inlet size - 2" , Rating - 300#	2	nos		1220	2440
2169	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V23	Inlet size - 1 1/2" , Rating - 600#	3	nos		920	2760
2170	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V30	Inlet size - 6" , Rating - 600#	6	nos		3650	21900
2171	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V32	Inlet size - 4" , Rating - 600#	4	nos		2430	9720
2172	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V33	Inlet size - 12" , Rating - 150#	4	nos		7290	29160
2173	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.11.1V34	Inlet size - 10" , Rating - 150#	6	nos		6080	36480
2174	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12	Cleaning, set pressure tests of pressure relief and thermal relief valves before installation, providing equipments, necessary test jig, instrument air, nitrogen cylinders, all consumables and loop testing including dropping/shifting of the PSV's/TSV's from the installed position(if required) to workshop for calibration/re-calibration/re-checking, etc., and reinstall back to original location including parts replacement, gasket, stud/bolts etc., re-fixing of the PSV's /TSV's including lapping (if required) but excludes flow calibration, calibration/test reports and excluding supply of valves					
2175	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.MC01	Inlet size - 10" , Rating - 150#	6	nos		6710	40260
2176	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V1	Inlet size - 1 1/2" , Rating - 150#	2	nos		2160	4320
2177	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V2	Inlet size - 1" , Rating - 150#	50	nos		1730	86500
2178	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V6	Inlet size - 1" , Rating - 300#	10	nos		1730	17300
2179	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V7	Inlet size - 1 1/2" , Rating - 300#	2	nos		2160	4320
2180	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V15	Inlet size - 2" , Rating - 300#	2	nos		2280	4560
2181	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V23	Inlet size - 1 1/2" , Rating - 600#	3	nos		2160	6480
2182	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V25	Inlet size - 6" , Rating - 150#	2	nos		3460	6920
2183	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V26	Inlet size - 8" , Rating - 150#	2	nos		5740	11480
2184	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V29	Inlet size - 6" , Rating - 600#	6	nos		3460	20760
2185	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V31	Inlet size - 4" , Rating - 600#	4	nos		2580	10320
2186	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.12.1V32	Inlet size - 12" , Rating - 150#	4	nos		7620	30480
2187	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13	Impulse line painting (uninsulated) as per painting specification for project					
2188	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13.1V1	Instrumentation impulse line of size 1/2" for temp. (-)14 to 80 degC	100	m		40	4000
2189	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13.1V2	Instrumentation impulse line of size 1/2" for temp. up to 120 degC	500	m		40	20000
2190	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13.1V3	Instrumentation impulse line of size 1/2" for temp. 120 to 200 degC	100	m		40	4000
2191	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13.1V4	Instrumentation impulse line of size 1/2" for temp. above 200 degC	100	m		40	4000
2192	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.13.1V10	Instrumentation impulse line of size 3/4" for temp. 120 to 200 degC	100	m		60	6000
2193	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17	Transportation of all line mounted flow instruments such as Coriolis Mass Flow Meter, magnetic flow meter, ultrasonic flow meter, variable area flow meter, vortex flow meter, venturi flow meter, flow nozzle, integral orifice flow meter, wedge flow meter from Owner's storage points to contractor's stores/worksite and installation of these Flow Meters for all rating, fixing of gaskets bolts/nuts wherever required as per specification, drawings and directions of Engineer-in-Charge.					
2194	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.MC01	Inlet Size - 18" , Rating - 150#	1	nos		8120	8120

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2195	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V1	Inlet Size - 1" , Rating - 300#	1	nos		1240	1240
2196	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V7	Inlet Size - 10" , Rating - 300#	1	nos		4740	4740
2197	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V8	Inlet Size - 12" , Rating - 300#	1	nos		5390	5390
2198	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V10	Inlet Size - 1" , Rating - 150#	11	nos		1240	13640
2199	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V19	Inlet Size - 2" , Rating - 150#	1	nos		1480	1480
2200	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V23	Inlet Size - 24" , Rating - 150#	1	nos		11460	11460
2201	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V36	Inlet Size - 6" , Rating - 150#	1	nos		2510	2510
2202	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V38	Inlet Size - 3" , Rating - 150#	1	nos		1780	1780
2203	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V39	Inlet Size - 10" , Rating - 150#	1	nos		4740	4740
2204	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V42	Inlet Size - 20" , Rating - 150#	1	nos		9210	9210
2205	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V63	Inlet Size - 8" , Rating - 600#	1	nos		3790	3790
2206	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.1V64	Inlet Size - 14" , Rating - 150#	1	nos		6000	6000
2207	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.MC02	Inlet Size - 12" , Rating - 1500#	1	nos		5390	5390
2208	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.17.MC03	Inlet Size - 8" , Rating - 150#	1	nos		3790	3790
2209	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21	Transportation of all types of Emergency vents from owner's storage point to contractor's store/worksite and installation of Emergency vents for all ratings including assembly, accessories if any, at all locations and fixing of gaskets, bolts/nuts wherever required as per drawings, specifications and as per the directions of engineer-in-charge.					
2210	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21.MC01	Inlet size - 12" , Rating - 150#	2	nos		7420	14840
2211	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21.1V2	Inlet size - 20" , Rating - 150#	2	nos		13460	26920
2212	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21.1V3	Inlet size - 24" , Rating - 150#	7	nos		16760	117320
2213	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21.1V5	Inlet size - 28" , Rating - 150#	2	nos		20190	40380
2214	A	B957-999-16-51-PK-SOR-9501-A-2M	01II.950.21.MC02	Inlet size - 16" , Rating - 150#	2	nos		10510	21020
2215	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ	EQUIPMENT - PACKAGE					
2216	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.1	INSTALLATION OF FREE ISSUE EQUIPMENT: Handling and transportation of Equipment from Owner's storage point to work site/contractor's stores. Assembly of subassemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (incldung supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of inter- connecting piping including some amount of cutting and welding, wherever required. Purging the line with air/gas, installation of insulation in all respects wherever applicable on equipments and piping as per Vendor drawings, application of touch-up paint (if required) after erection and assembly at site, providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below :					
2217	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.1.7	Loading Arm(Manual)	5	MT		32930	164650
2218	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.3	INSTALLATION OF FIELD ASSEMBLED FREE ISSUE PACKAGES COMPRISING OF KNOCKED DOWN EQUIPMENT: Handling and transportation of Package consisting of single or multiple skids including interconnecting piping between skids from Owner's storage point to work site/contractor's stores. Assembly of sub-assemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (including supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of vendor's supplied loose inter- connecting piping including instruments, piping accessories and supports, wherever required. Purging the line with air/gas as per the instruction of Package supplier (wherever applicable), installation of insulation in all respects wherever applicable on equipments and piping as per Vendor drawings, application of touch-up paint (if required) after erection and assembly at site, providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below : NOTE (1): Erection of Vendor's supplied loose interconnecting piping is already covered above and the indicated weight of respective package mentioned below includes the same. NOTE (2): Contractor's scope shall also cover field welding which includes fabrication & hydro/pneumatic testing, DPT/MPT/NDT testing, etc. of vendor's supplied loose interconnecting piping(pre-fabricated spools/commercial length), wherever required. Same shall be payable extra at the rate provided against respective piping SOR items.					
2219	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.3.4	Bagging and Palletising System	640	MT		52000	33280000
2220	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.3.48	Vapor Recovery System	130	MT		52000	6760000
2221	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7	Chain Pulley Block					
2222	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1	Supply of Geared Trolley Mounted Chain Pulley Block					
2223	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1	Procurement & delivery of Chain Pulley Block (CPB) with its trolley, lift up to 8 m and average 8 m distance from monorail to operating floor irrespective of monorail beam size. For upward revision of height of lift and (or) operating floor distance below monorail beyond the aforesaid limit, payment shall be adjusted based on respective quoted rate for per meter increase in the height of lift and operating floor distance below monorail.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2224	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V2	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 10 MT	1	nos		480910	480910
2225	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V3	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 3 MT	2	nos		283250	566500
2226	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V4	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 1 MT	2	nos		189760	379520
2227	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V5	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 2 MT	2	nos		236900	473800
2228	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V6	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 5 MT	2	nos		309520	619040
2229	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V7	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 7.5 MT	1	nos		381400	381400
2230	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.1.1.1V9	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 15 MT	1	nos		607270	607270
2231	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2	Supply of Hook Mounted Chain Pulley Block (Without Geared Trolley)					
2232	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2.1	Procurement & delivery of Chain Pulley Block (CPB),suitable for lift upto 8 m and average 8 m distance from suspension hook to operating floor. Also refer Scope of work /Job Specification attached with the tender. For upward revision of height of lift and (or) operating floor distance below suspension hook beyond the aforesaid limit, payment shall be adjusted based on respective quoted rate for per meter increase in height of lift and operating floor distance below monorail.					
2233	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2.1.1V2	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 1 MT	1	nos		46350	46350
2234	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2.1.1V4	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 2 MT	1	nos		93220	93220
2235	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2.1.1V5	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 3 MT	1	nos		139820	139820
2236	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.2.1.1V6	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 5 MT	1	nos		233040	233040
2237	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.4	Installation of Geared Trolley Mounted Chain Pulley Block / Geared Trolley (of Chain Pulley Block)					
2238	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.4.1	Transportation of Equipment from Owner's store/Contractor's store to work site. Assembly of subassemblies, placing the equipment on monorail, levelling, aligning, fixing of bolts, providing manpower for carrying out trial and start up runs and testing under the supervision guidance of manufacturer/clients- personnel and rectifying defects of any and completing the work in all respects as per drawing, specifications and instructions of engineer in charge for each equipment including accessories. Also refer Scope of work /Job specification attached with the tender.					
2239	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.4.1.1	Chain Pulley Block Capacity- Upto 10 MT	10	nos		48090	480900
2240	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.4.1.2	Chain Pulley Block Capacity- from 15 MT to 25 MT	1	nos		97160	97160
2241	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.5	Installation of Hook Mounted Chain Pulley Block					
2242	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.5.1	Transportation of Equipment from Owner's store/Contractor's store to work site. Assembly of subassemblies, placing the equipment on hook, providing manpower for carrying out trial and start up runs and testing under the supervision guidance of manufacturer/clients- personnel and rectifying defects of any and completing the work in all respects as per drawing, specifications and instructions of engineer in charge for each equipment including accessories. Also refer Scope of work /Job specification attached with the tender.					
2243	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.5.1.1	Chain Pulley Block Capacity- Upto 10 MT	4	nos		23310	93240
2244	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.6	For supply: Unit Rate (addition) per meter increase in height of lift(due to increase in load chain length etc.) for Chain Pulley Block as per scope of work/Job specification defined in the tender.					
2245	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.6.1	Chain Pulley block capacity upto10 MT	5	per metre length		2290	11450
2246	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.6.2	Chain Pulley Block capacity from 15 MT to 25 MT	5	per metre length		3300	16500
2247	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.7	For supply: Unit Rate (addition) per meter increase in distance from monorail/point of suspension to operating floor(due to increase in hand chain length etc.) for Chain Pulley Block as per scope of work/Job specification defined in the tender.					
2248	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.7.1	Chain Pulley Block Capacity upto 10 MT	10	per metre length		650	6500
2249	A	B957-999-80-42-PK-SOR-9501-A-0M	01QQ.7.7.2	Chain Pulley Block Capacity from 15 MT to 25 MT	10	per metre length		910	9100
2250	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR	EQUIPMENT - ROTATING					
2251	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1	Handling and transportation of Rotating Equipment & miscellaneous items of equipment package from Owner's storage points to work site / contractor's stores, assembly of sub-assemblies, field assembly (as applicable) placing the equipment on foundations, (including some amount of cutting, welding & field joints wherever required), levelling, aligning, fixation of foundation bolts, providing (including supply) packing / shim plates (as applicable), including chipping & dressing of foundations, grouting (including supply and application of grout material, equipment base frame filling as per vendor recommendation with specified grout), cleaning and flushing, draining and drying, purging of lines, and providing manpower and tools / equipment for NDT, testing, carrying out trial and start-up runs and testing under supervision of manufacture's / customer personnel, rectifying defects (if any), insulation (as applicable), precommissioning and commissioning (as applicable) and completing the work in all respects as per drawings, job specifications / scope of work and instructions of Engineer-in-charge for each equipment including drivers and accessories, as listed below. NOTE: Scope also includes erection, fabrication, insulation (as applicable), welding & field joints wherever required, installation & NDT of vendor supplied prefabricated spools / commercial length between various skids of an equipment package (payable at the rate provided against piping SOR items).					
2252	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.MG01	Initial fill of lubricants, sealing fluid & other consumables etc. required for startup and commissioning of Free Issue Item as per document no. B957-999-80-42-SOW-9501_Sec. C	3150	Litre		310	976500
2253	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.1	Pump Packages (all types) with drivers, auxiliaries and accessories.					
2254	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.1.1	All Types of Pumps (Electric Motor Driven) along with driver, auxiliaries and accessories (Single Skid).	904.5	MT		36890	33367005

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2255	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.1.2	All Types of Pumps (General Purpose Steam Turbine driven) along with driver, auxiliaries and accessories (Single Skid).	20	MT		36890	737800
2256	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.4	Packaged Reciprocating Compressor Packages with drivers, auxiliaries and accessories.					
2257	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.4.1	Packaged Reciprocating Compressors on single skid with driver (Electric Motor), auxiliaries and accessories.	48	MT		39730	1907040
2258	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.7	Rotary Compressor and Blower Packages with drivers, auxiliaries and accessories.					
2259	A	B957-999-80-42-PK-SOR-9501-A-0M	01RR.1.7.4	Blowers (Turbo, lobe, liquid ring etc.) with drivers (Electric Motor), auxiliaries and accessories.	50	MT		39730	1986500
2260	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV	EQUIPMENT - STATIC					
2261	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30	EQUIPMENT ERECTION					
2262	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.1	EQUIPMENT ERECTION: Transportation of reactors, columns, vessels, silencers, heat exchangers (shell and tube, plate fin, plate) and electric heater etc. from owner's storage point to work site, assembly of parts, subassemblies, erection at all elevations, aligning, verticality checking, grouting, tightening of foundation bolts, welding of washer on anchor chairs, erection of wooden pillow for cold equipments, stacking of multi-tier exchanger(which are stored in unstacked condition), arranging hooks for test ring/ test flanges in heat exchangers, installation of demister, internal gratings, distributor, pipe davit, installation of mixer/agitator, cleaning and flushing by water, draining, drying by compressed air, arranging all tools, tackles, machinery, consumables, transportation equipment, erection equipment, instruments, labour, ancillary, etc. to complete the work in all respects as per drawings, equipment detail, specifications and instructions of the Engineer-in-Charge.					
2263	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.1.2	Equipment weighing less than 100 MT but 50 MT and above	75	MT		39730	2979750
2264	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.1.3	Equipment weighing less than 50 MT but 30 MT and above	35	MT		39730	1390550
2265	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.1.4	Equipment weighing less than 30 MT but 10 MT and above	18	MT		39730	715140
2266	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.1.5	Equipment weighing less than 10 MT	30	MT		39730	1191900
2267	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3	HYDROTESTING OF EQUIPMENT					
2268	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3.2	HYDROSTATIC TESTING OF EXCHANGERS (shell and tube): Hydrostatic testing of exchangers single tier or multitier including dismantling and reassembling of piping connections wherever required, providing blinds and gaskets on nozzles, piping, arranging water hoses, gauges, valves, test pumps and all other temporary arrangements, labour and materials, drying by hot compressed air as per specifications and instructions of Engineer-in-Charge. In case, if leakage is found in gaskets and gaskets are replaced, then re-hydrotest to be done with new gasket after reassembly. (AS PER ERECTION SPECIFICATION ENCLOSED)					
2269	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3.2.1	Hydrotesting of shell side					
2270	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3.2.1.1	upto 20m3	1	nos		39730	39730
2271	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3.2.2	Hydrotesting of tube side					
2272	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.3.2.2.1	upto 20m3	1	nos		39730	39730
2273	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.7	LETTERING AND STENCILING: Surface preparation, supply and application of primer and paint on insulated and uninsulated equipment for lettering, stenciling on vessels, columns, drums, for the purposes of identification (Equipment Name, Equipment Number & Service Description) as per applicable painting specification enclosed elsewhere in the tender document, arranging scaffolding for all heights, labour, materials, tools, tackles, supervision etc. to complete the work as per specifications and instructions of Engineer-in- Charge.	900	Per Letter		210	189000
2274	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.12	ERECTION OF BURIED EQUIPMENT : Transportation of vessels from Owner's storage point to worksite, repair/ touch up of finish paint, arrangement of all accessories, equipments, labour etc., placing/erection of vessel in trenches/pits including assembly of parts, subassemblies, aligning, verticality checking, grouting, tightening of foundation bolts, arranging all tools, tackles, machinery, consumables etc to complete the work in all respects as per drawings, equipment detail, specifications and instructions of the Engineer-in-Charge.					
2275	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.12.4	Equipment weighing less than 30 MT but 10 MT and Above	120	MT		34280	4113600
2276	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13	WELDING & NDT OF CUT NOZZLES / SUMP / BOOT OF BURRIED VESSELS: Assembly of cut nozzles/Sump/Boot(as shown in Respective Engg. Data Sheet), vertically checking, alignment, Welding of cut nozzles , NDT such as 100% radiography ,UT , surface preparation of the weld seam portion, application of primer, painting, arranging all tools and tackles, machinery. Consumables, transportation/handling of equipment, labour etc to complete the work in all respects as per drawings & instruction of Engineer-in charge.					
2277	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.4	MOC : Carbon Steel ,Nozzle size : 6"	12	nos		7480	89760
2278	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.10	MOC : Carbon Steel ,Nozzle size : 18"	2	nos		22430	44860
2279	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.11	MOC : Carbon Steel ,Nozzle size : 20"	2	nos		24930	49860
2280	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.12	MOC : Carbon Steel ,Nozzle size : 24"	13	nos		29910	388830
2281	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.13	MOC : Carbon Steel ,Nozzle size : 28"	1	nos		34900	34900
2282	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.13.14	MOC : Carbon Steel ,Nozzle size : 30"	1	nos		37390	37390
2283	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.14	CHEMICAL CLEANING OF REACTOR/COLUMN/VESSEL: Procurement of all materials, carrying out chemical cleaning / pre-cleaning / degreasing / passivation (as applicable) of equipment, arranging labour, materials, tools and tackles, consumables, supervision etc. required to complete the work in all respects as per job specification attached with the tender document and directions of Engineer-in-charge. Refer mechanical data sheet/Scope of Supply/Work attached with the tender.					
2284	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.14.1	Chemical Cleaning					
2285	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.14.1.1	upto 20m3	2	nos		412000	824000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2286	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.14.1.2	above 20m3 to 50m3	1	nos		1030000	1030000
2287	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15	CHEMICAL CLEANING OF HEAT EXCHANGER/HEATER: Procurement of all materials, carrying out chemical cleaning / pre-cleaning / degreasing / passivation (as applicable) of equipment, arranging labour, materials, tools and tackles, consumables, supervision etc. required to complete the work in all respects as per job specification attached with the tender document and directions of Engineer-in-charge. Refer mechanical data sheet/Scope of Supply/Work attached with the tender.					
2288	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.1	Chemical Cleaning (Shell Side)					
2289	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.1.1	upto 20m3	1	nos		412000	412000
2290	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.1.2	above 20m3 to 50m3	1	nos		1030000	1030000
2291	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.5	Chemical Cleaning (Tube Side)					
2292	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.5.1	upto 20m3	1	nos		412000	412000
2293	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.30.15.5.2	above 20m3 to 50m3	1	nos		1030000	1030000
2294	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40	EQUIPMENT INSULATION					
2295	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.1	HOT INSULATION: Providing thermal insulation including supply of all insulating and ancillary material, weather protective covering, consumables and other necessary materials, testing of the material as required including transportation of the materials to work sites, applying insulation on surfaces as specified, including all preparatory works thereon, all binding, tying, lacing, stitching and/or otherwise securing, providing vapour barrier, finishing with plain/corrugated sheet cladding or as specified, providing bolts, rivets, self tapping screws wherever specified, providing inspection windows etc., arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc., labour and supervision and completing the work in all respect at all heights as per drawings, specifications and instructions of Engineer-in-Charge.					
2296	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.1.4	Shells and heads of horizontal vessels, columns, reactors, exchangers, silencers etc and heads of above mentioned vertical equipments. Surface material SS. Insulation type: IH &IT (Rockwool).					
2297	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.1.4.7	Insulation Thickness: 65mm	90	m²		7900	711000
2298	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.2	COLD INSULATION: Providing cold insulation including supply of all insulating and anciliary material, protective covering, consumables and other necessary materials, testing of the material as required including transportation of the materials to work sites, applying insulation on surfaces as specified, including all preparatory works thereon, all binding, tying, lacing, stitching and/or otherwise securing, providing vapour barrier, finishing with plain/corrugated sheet cladding or as specified, providing bolts, rivets, providing vapour stop etc. arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc. labour and supervision and completing the work in all respect at all heights as per drawings, specifications and instructions of Engineer-in-Charge.					
2299	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.2.MG01	Shells and heads of horizontal vessels, columns, reactors, exchangers, silencers etc and heads of above mentioned vertical equipments. Surface material SS. Insulation type: Inner layer : polyisocyanurate (PIR) insulation (ASTM C591, Grade-2, Type-II), 140 mm Outer layer: Ic (Cellular glass, ASTM C 552, Grade 6, Type-II), 50 mm	170	m²		9630	1637100
2300	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.2.4	Shells and heads of horizontal vessels, columns, reactors, exchangers, silencers etc and heads of above mentioned vertical equipments. Surface material SS. Insulation type: Ic (Cellular glass, ASTM C 552, Grade 6, Type-II).					
2301	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.2.4.16	Insulation Thickness: 225mm	10	m²		32490	324900
2302	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.3	PERSONAL PROTECTION INSULATION (METAL CAGE/GUARD, FOR HORIZONTAL/ VERTICAL EQUIPMENT): Providing the metal cage/ guards (STAINLESS STEEL Wire netting type as per EIL specification) including supply of all material, transportation of the materials to work sites, installation of the fabricated cage on the surfaces of the equipment, Including all preparatory works thereon, all binding, tying or otherwise securing, arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc., labour and supervision and completing the work in all respect at all heights as per the specifications and instructions of Engineer-in-Charge.					
2303	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.40.3.1	For the Shells and Heads of Horizontal/ Vertical Equipment	1	m²		3610	3610
2304	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50	EQUIPMENT PAINTING					
2305	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.MG01	Supply and application of touch up paint for carbon steel underground vessels , rubdown and touch up of shop primer/finish paint (primer/finish paint as per applicable specification) wherever required as per attached specification, providing scaffolding for all heights, labour, material, tools and tackles, consumables, supervision etc. to complete the work in all respect as per specifications, drawings, equipment details for painting and direction of Engineer in-Charge for all type of uninsulated equipment. The surface area is as per respective temperature ranges given below as per applicable specification. Note: Only Touch Up Paint shall be provided by Mechanical contractor, Surface preparation and primer application and finish paint shall be provided by equipment supplier.					
2306	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.MG01.01	FOR UNDERGROUND VESSELS: (TAG NO: 500-VV-HI-003, 500-VV-HI-005, 500-VV-HI-006, 500-VV-HI-009) Surface preparation & Primer: SSPC-SP -10 AND 1 coat of F-17 primer @400 µ DFT/ coat Finish Paint: 1 coat of F-17 @400µ DFT/ coat TOTAL DFT - 800 MICRONS Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01	50	sqm		990	49500
2307	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.MG01.02	FOR ITEM NO: 441-VV-HW-101 (INTERMEDIATE LP FLARE KOD): Design Temperature: -29/150 Deg C Surface Preparation & Primer: SSPC-SP-10 for CS, LTCS & Alloy Steel, SSPC-SP-16 for SS ; (15-25µ surface profile), 1 coat of F-16 @125 µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01.	35	m²		1190	41650

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2308	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.MG01.03	FOR ITEM NO: 500-VV-VI-003 (BUTENE-1 UNLOADING COMPRESSOR SUCTION KOD AND 500-VV-VI-004 (PROPYLENE UNLOADING COMPRESSOR SUCTION KOD): Primer: SSPC-SP -10; 1 coat of F-9@ 65-75 µ DFT/ coat + 1 coat of P-6@ 40µ DFT/ coat. Intermediate coat: 1 coat of F-6B@ 100 µ DFT/ coat. Finish Paint: 1 coat of F-2 @ 40µ DFT/ coat TOTAL DFT - 245-225 MICRONS Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01	10	m²		620	6200
2309	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.3	PAINTING (INSULATED EQUIPMENT) FOR STAINLESS STEEL					
2310	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.3.MG02	Supply and application touch up paint on Stainless Steel vessels, columns, reactors, silencers, exchangers and other equipment, including rubdown and touch up of shop primer (primer as per applicable specification) wherever required, as per attached specification, providing scaffolding for all heights, labour, materials, tools and tackles, consumables and supervision etc. to complete the work in all respect as per specifications, drawings, equipment details for painting and direction of Engineer in-Charge. The surface area is as per respective temperature ranges given below as per applicable specification. Note: Touch up paint shall be provided by Mechanical contractor, Surface preparation and first coat of primer application and finish paint shall be provided by equipment supplier.					
2311	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.3.MG02.01	For Shell side of Exchanger (Item No: 500-EE-AT-001, 500-EE-AT-002, 500-EE-AT-003); MOC SS304L Design Temperature: 240 Deg C Primer: SSPC-SP-16; (15-25µ surface profile), 1 coat of F-16 @125 µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01	10	m²		1190	11900
2312	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.3.MG02.02	For Tube side of Exchanger (Item No: 500-EE-AT-001, 500-EE-AT-002, 500-EE-AT-003); MOC SS304L Design Temperature: -110/65 Deg C Surface Preparation & Primer: SSPC-SP-10 for CS, LTCS & Alloy Steel, SSPC-SP-16 for SS ; (15-25µ surface profile), 1 coat of F-16 @125 µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01.	10	m²		1190	11900
2313	A	B957-999-80-42-PK-SOR-9501-A-0M	01VV.50.3.MG02.03	FOR ITEM NO: 500-VV-HI-004 (COLD BLOWDOWN KOD); MOC SS304L Design Temperature: -110/65 Deg C Surface Preparation & Primer: SSPC-SP-10 for CS, LTCS & Alloy Steel, SSPC-SP-16 for SS ; (15-25µ surface profile), 1 coat of F-16 @125 µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01.	20	m²		1190	23800
2314	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS	STRUCTURAL					
2315	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1	EARTH WORK (REFER SPECIFICATION NO. 6-68-0003)					
2316	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.1	Earthwork excavation in soil					
2317	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.1.1	Earth work in EXCAVATION below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	400	m³		300	120000
2318	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.1.2	Earth work in EXCAVATION below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth beyond 1.5m and upto and inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	25	m³		350	8750
2319	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.2	Earthwork excavation in soft rock					
2320	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.2.1	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	300	m³		720	216000
2321	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.2.2	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 1.5m and upto & inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	20	m³		880	17600
2322	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.4	Earthwork excavation by controlled blasting (Explosive/ Non-explosive)					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2323	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.4.11	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Hard Rocks, for a depth of 1.5m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	1	m³		2290	2290
2324	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.4.12	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Hard Rocks, for a depth beyond 1.5m and upto & inclusive of 3.0m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	1	m³		2590	2590
2325	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.4.MD1311	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Soft Rocks, for a depth of 1.5m including all related work for non explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holeswith non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area,chiselling & cutting to required levels, dressing & trimmingof sides, levelling & grading of bottoms, dewatering of accumulated water from anysource and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	100	cum		2080	208000
2326	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.4.MD1312	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Soft Rocks, for a depth beyond 1.5m and upto & inclusive of 3.0m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	10	cum		2360	23600
2327	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.5	Earthwork excavation by chiselling					
2328	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.5.1	Earth work in EXCAVATION below ground level for all kinds of works in HARD ROCKS for a depth upto 1.5m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	1	m³		1820	1820
2329	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.5.2	Earth work in EXCAVATION below ground level for all kinds of works in HARD ROCKS for a depth beyond 1.5m and upto & inclusive of 3.0m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	1	m³		2020	2020
2330	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.5.MD1301	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCKS for a depth upto 1.5m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	1250	cum		1610	2012500
2331	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.5.MD1302	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCKS for a depth beyond 1.5m and upto & inclusive of 3.0m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete	50	cum		1770	88500
2332	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.6	SHORING AND STRUTTING					
2333	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.6.1	Providing and installing approved type of "SHORING AND STRUTTING" by open timbering method for all depths to retain earth including dismantling and removal of the same etc. from site after completion of work etc. all complete as directed.	50	m²		400	20000
2334	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.6.2	Providing and installing approved type of "SHORING AND STRUTTING" by close timbering method for all depths to retain earth including dismantling and removal of the same etc. from site after completion of work etc. all complete as directed.	25	m²		580	14500

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2335	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7	Backfilling after execution of work					
2336	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.1	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps within a LEAD OF 100M, including re- excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/ mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	350	m³		270	94500
2337	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.2	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps beyond a LEAD OF 100M AND UPTO & INCLUSIVE OF 500M including re-excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	50	m³		320	16000
2338	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.3	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps beyond a LEAD OF 500M AND UPTO & INCLUSIVE OF 1KM including re-excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	25	m³		340	8500
2339	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.MD1301	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock beyond a LEAD OF 3KM ANDUPTO & INCLUSIVE OF 5KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	150	cum		490	73500
2340	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.MD1302	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock beyond a LEAD OF 1KM AND UPTO & INCLUSIVE OF 3KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	150	cum		450	67500
2341	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.7.MD1303	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock within a LEAD OF 1KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	25	cum		410	10250
2342	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.9	Earthwork Filling by excavation					
2343	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.9.4	EARTHWORK IN FILLING by excavating the earth from BORROW AREAS arranged by CONTRACTOR for all leads, transporting the earth from borrow area including cleaning & stripping the earth at borrow areas, breaking clods, loading, unloading and laying at all depths and heights in layers of thickness not exceeding 15 cms., watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% of the maximum laboratory dry density, dressing, trimming, levelling the top surface etc. in foundations, plinths, trenches etc. all complete.	800	m³		600	480000
2344	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.10	Transporting & Disposing the SURPLUS EARTH AND DEBRIS					
2345	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.10.1	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 100M AND UPTO 1KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	155	m³		220	34100
2346	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.10.2	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 1.0KM AND UPTO & INCLUSIVE OF 3.0KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	155	m³		240	37200
2347	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.10.3	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 3.0KM AND UPTO & INCLUSIVE OF 5.0KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	5	m³		270	1350
2348	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.10.5	"Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction areas to areas ANYWHERE OUTSIDE THE PLANT BOUNDARY, including re-excavating the deposited soil excavated earlier, loading, transportation, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids). DISPOSAL AREAS OUTSIDE PLANT BOUNDARY TO BE ARRANGED BY THE CONTRACTOR. Royalty as applicable for disposal outside plant limits to be borne by the Contractor. "	5	m³		340	1700
2349	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.11	Transportation of ROCK material					
2350	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.11.1	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 BEYOND INITIAL LEAD OF 100M AND UPTO 1KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	100	m³		320	32000
2351	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.11.2	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 beyond initial LEAD OF 1.0KM AND UPTO & INCLUSIVE OF 3.0KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	250	m³		340	85000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2352	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.11.3	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 beyond initial LEAD OF 3.0KM AND UPTO & INCLUSIVE OF 5.0KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	1350	m³		380	513000
2353	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.14	Earthwork Manual Excavation in SOIL					
2354	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.14.1	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	10	m³		690	6900
2355	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.14.2	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth beyond 1.5m and upto and inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	5	m³		790	3950
2356	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.15	Earthwork Manual Excavation in SOFT ROCK					
2357	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.15.1	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	10	m³		1630	16300
2358	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.15.2	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 1.5m and upto & inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	5	m³		1820	9100
2359	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.16	TRIAL PIT in Soil					
2360	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.16.1	Excavation of TRIAL PITS by Manual Means for determining the underground facilities in all type of soils for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes (if required), disposal or stacking of excavated material within a lead of 100m, dewatering of accumulated water from any source, keeping the surface dry for subsequent works, barricading the area, preparing location & depth wise record of underground facilities and restoration of trial pits by excavated earth to original condition by compacting/ ramming the soil, etc. all complete as directed by Engineer-in-Charge including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables, etc., but excluding shoring and strutting.	10	cum		670	6700
2361	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.1.16.2	Excavation of TRIAL PITS by Manual Means for determining the underground facilities in all type of soils for a depth beyond 1.5m and upto 3.0m, including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes (if required), disposal or stacking of excavated material within a lead of 100m, dewatering of accumulated water from any source, keeping the surface dry for subsequent works, barricading the area, preparing location & depth wise record of underground facilities and restoration of trial pits by excavated earth to original condition by compacting/ ramming the soil, etc. all complete as directed by Engineer-in-Charge including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables, etc., but excluding shoring and strutting.	5	cum		770	3850
2362	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2	PLAIN & REINFORCED CEMENT CONCRETE: (REFER SPECIFICATION NO. 6-68-0004)					
2363	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.17	PCC - Non FIM Items					
2364	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.17.1	Providing and laying PLAIN CEMENT CONCRETE for all depths below and upto plinth level in foundations, drains, fillings, non-suspended floors, pavements & ramps or any other works etc. including shuttering, tamping, ramming, vibrating, curing etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed all complete for concrete of nominal mix 1:5:10 by mass (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregates/Gravels) with 40mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	30	m³		6750	202500
2365	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.17.5	Providing and laying PLAIN CEMENT CONCRETE of nominal mix 1:3:6 by mass (1 Cement : 3 Sand : 6 Crushed Stone Aggregates) with 10mm and down size graded crushed stone aggregates below and upto plinth level as SCREED in trenches, floor slabs, sumps, channels, drains etc. for all depths including shuttering, tamping, curing etc. as specified in any shape, level, thickness, position and finishing the top surface smooth etc. all complete as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m³		7370	14740
2366	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.17.8	Providing and laying PLAIN CEMENT CONCRETE for all depths below and upto plinth level in foundations, drains, fillings, non-suspended floors, pavements & ramps or any other works etc. including shuttering, tamping, ramming, vibrating, curing, etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed all complete for concrete grade M20 with 20mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	150	m³		8860	1329000
2367	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.18	RCC Substrutures - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2368	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.18.16	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUB-STRUCTURE e.g. foundations, raft, beams, slabs, pile caps, retaining walls, dyke walls, jambs, counterforts, buttresses, pedestals, pipe sleepers, columns, suspended floors, staircases, landings, steps, brackets etc., including equipment/ machine foundations & pedestals viz. compressors, ID & FD fans, pumps, generators, crushers, mills, etc., (including single pour concreting as specified on the drawing), applying cement wash on concrete surface (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering, etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING & SPECIFIED ADMIXTURES) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	350	m^3		9740	3409000
2369	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.18.21	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUB-STRUCTURE e.g. trenches, culverts, manholes, pipe encasement, catchpits, drains, pits, etc., applying cement wash on concrete surface (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering, etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING & SPECIFIED ADMIXTURES) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		10230	20460
2370	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.19	RCC Superstructures - Non FIM Items					
2371	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.19.16	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUPER STRUCTURE in suspended floors, slabs, beams, columns, walls including counterforts, staircases, landings, steps, facias, fins, mouldings, gutters, shelves, window sills, canopies, lintels, girders, ducts, brackets, chajjas with drip moulds, pedestals, posts, struts, equipment/ machine foundations, ramps etc. (including single pour concreting as specified on the drawing), providing cement wash (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING AND SPECIFIED ADMIXTURES) FOR ALL HEIGHTS UPTO & INCLUSIVE OF 20 m ABOVE PLINTH LEVEL in any shape, position, thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		10640	21280
2372	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.19.21	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUPER STRUCTURE in suspended floors, slabs, beams, columns, walls including counterforts, staircases, landings, steps, facias, fins, mouldings, gutters, shelves, window sills, canopies, lintels, girders, ducts, brackets, chajjas with drip moulds, pedestals, posts, struts, equipment/ machine foundations, ramps etc. (including single pour concreting as specified on the drawing), providing cement wash (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING AND SPECIFIED ADMIXTURES) FOR ALL HEIGHTS MORE THAN 20 m ABOVE PLINTH LEVEL in any shape, position, thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		11700	11700
2373	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.20	RCC Flooring - Non FIM Items					
2374	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.20.2	Providing and laying REINFORCED CEMENT CONCRETE OF M-20 GRADE with 20mm and down size graded crushed stone aggregates / gravel in NON-SUSPENDED slabs / pavement slabs including pedestals, ramps etc. leaving pockets, laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough or smooth, including cost of admixtures if used, providing pockets, openings, recesses, chamfering etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT AND SHUTTERING) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		8290	16580
2375	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22	Precast Elements - Non FIM Items					
2376	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.4	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit upto and inclusive of 500 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		19430	19430
2377	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.5	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit beyond 500 kg and upto and inclusive of 1000 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		19480	19480

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2378	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.6	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit beyond 1000 kg and upto and inclusive of 2000 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m³		19630	19630
2379	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.MD1327	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit upto and inclusive of 1000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19480	19480
2380	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.MD1328	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit beyond 1000 kg and upto and inclusive of 3000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19790	19790
2381	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.22.MD1329	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit beyond 3000 kg and upto and inclusive of 5000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19940	19940
2382	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.23	HYD Bars / MS Bars - Non FIM Items					
2383	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.23.8	Supplying and placing in position HIGH YEILD-STRENGTH DEFORMED STEEL BARS REINFORCEMENT of Grade Fe500D (TMT) conforming to IS:1786, for RCC work including transporting the Steel, straightening, cleaning, decoiling, cutting, bending to required shapes and lengths as per details, binding with 18 SWG black soft annealed binding wire at every intersection, supplying and placing with proper cover blocks, supports, chairs, overlaps, welding, spacers, fanhooks etc. for all heights and depths etc. all complete as directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	60	MT		94290	5657400
2384	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.24	Conc. Encasing - Non FIM Items					
2385	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.24.3	Providing and laying Reinforced Cement Concrete of grade M-25 with 20mm and down size graded stone aggregates for ENCASING OF STRUCTURAL STEEL WORK including chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (excluding the cost of Reinforcement and Shuttering) for all heights and depths in any shape, position, and thickness etc. all complete as specified and shown. Cement. All materials supplied by the contractor.	1	m³		9470	9470
2386	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.25	Centering and Shuttering - Non FIM Items					
2387	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.25.1	Providing and fixing CENTERING AND SHUTTERING in foundations, footings,raft beams, slabs, pile caps, retaining walls, jambs, counter-forts, buttresses, trenches, equipment/machine foundations, pedestals, abutments, pipe sleepers, columns, plinth beams, lintels, suspended slabs, beams, staircases, landings, steps, non-circular tunnels/bunkers/ silos/ shafts/ hoppers/liquid storage structures etc. for all depths below and upto & inclusive of plinth level including shuttering for single pour concreting, strutting, bracing, propping etc., keeping the same in position during concreting and removal of the same after specified period etc. for Straight/ Inclined Shuttering, keeping necessary provision for inserts, projecting dowels, anchor bolts or any other fixture etc. all complete and as specified and directed.	1500	m²		420	630000
2388	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.25.2	Providing and fixing CENTERING AND SHUTTERING in superstrctures in retaining walls, jambs, counter-forts, buttresses, equipment/ machine foundations, abutments,columns, lintels, suspended slabs, beams, staircases, landings, steps, non-circular tunnels/ bunkers/ silos/ shafts/ hoppers/ liquid storage structures etc. for all heights above plinth level including shuttering for single pour concreting, strutting, bracing, propping etc., keeping the same in position during concreting and removal of the same after specified period etc. for Straight/ Inclined Shuttering, keeping necessary provision for inserts, projecting dowels, anchor bolts or any other fixture etc. all complete and as specified and directed.	50	m²		760	38000
2389	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26	Expansion joints - Non FIM Items					
2390	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26.1	Providing 20mm wide EXPANSION JOINTS in flooring and pavement slabs and ISOLATION JOINTS around equipment foundations/columns/pedestal/trenches etc. including cleaning the joints of all loose material, filling clean sand for the full depth of slab (upto and inclusive of 300 mm) except for 12mm depth from top and sealing the top 12mm with approved two part liquid polysulphide Sealing Compound as per IS:12118 etc. all complete as shown, specified and directed.	5	m		570	2850

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2391	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26.2	Supplying and fixing in position 25mm thick BITUMEN IMPREGNATED FIBRE BOARD conforming to IS:1838 of approved quality in expansion joints at all locations and levels in concrete structures etc. all complete as shown, specified and directed.	5	m²		1860	9300
2392	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26.3	Supplying and fixing in position 50 mm (2X25 mm) thick BITUMEN IMPREGNATED FIBRE BOARD conforming to IS:1838 of approved quality in expansion joints at all locations and levels in concrete structures etc. all complete as shown, specified and directed.	1	m²		2210	2210
2393	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26.4	Supplying and sealing EXPANSION JOINTS 25 mm wide and 12mm deep at all locations and levels in Concrete Structures with approved two part liquid POLYSULPHIDE SEALING COMPOUND as per IS:12118 including raking of joints etc. all complete as shown, specified and directed.	25	m		490	12250
2394	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.26.5	Supplying and sealing EXPANSION JOINTS 50 mm wide and 12mm deep at all locations and levels in Concrete Structures with approved two part liquid POLYSULPHIDE SEALING COMPOUND as per IS:12118 including raking of joints etc. all complete as shown, specified and directed.	5	m		630	3150
2395	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.28	Mechanical Rebar Couplers - Non-FIM items					
2396	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.28.3	"Supplying and fixing MECHANICAL REBAR COUPLER of approved make for jointing high strength deformed steel reinforcement bars of Grade Fe500D (conforming to IS:1786) of dia. upto and inclusive of 25 mm at all levels & locations including testing as per manufacturer's recommendations, adjusting etc. all complete as specified and directed. "	5	each		290	1450
2397	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.28.4	"Supplying and fixing MECHANICAL REBAR COUPLER of approved make for jointing high strength deformed steel reinforcement bars of Grade Fe500D (conforming to IS:1786) of dia. above 25 mm at all levels & locations including testing as per manufacturer's recommendations, adjusting etc. all complete as specified and directed. "	5	each		370	1850
2398	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.29	Fixing Re-bars in already cast concrete - Non FIM Items					
2399	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.29.1	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. upto 12 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	20	each		1060	21200
2400	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.29.2	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. 16 mm & 20 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	10	each		1140	11400
2401	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.2.29.3	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. 25 mm & 28 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	5	each		1420	7100
2402	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4	STRUCTURAL STEEL WORKS SPEC NO. 6-68-0006					
2403	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1	General Steel Works - FIM Items					
2404	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1.5	Transporting from storage yard (or any other location as specified by engineer-in-charge), Storing, Assembling and Erecting in position and testing/ examining, bolted and/ or welded, already Fabricated STRUCTURAL STEEL (of any Grade) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. ALREADY FABRICATED STRUCTURAL STEEL SHALL (WITH CONNECTION BOLTS) BE PROVIDED TO CONTRACTOR FREE OF COST. SUPPLY OF ALL OTHER MATERIAL IN CONTRACTOR'S SCOPE.	15	MT		17310	259650
2405	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1.6	Transporting from storage yard (or any other location as specified by engineer-in-charge), Storing, Assembling and Erecting in position and testing/ examining, bolted and/ or welded, already Fabricated STRUCTURAL STEEL (of any Grade) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. ALREADY FABRICATED STRUCTURAL STEEL SHALL (WITH CONNECTION BOLTS) BE PROVIDED TO CONTRACTOR FREE OF COST. SUPPLY OF ALL OTHER MATERIAL IN CONTRACTOR'S SCOPE.	0.5	MT		27600	13800
2406	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1.9	Modification and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY FABRICATED BY OTHERS, including all builtup/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos,bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding etc., all complete as specified and directed. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY FABRICATED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	0.5	MT		45110	22555

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2407	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1.MD1307	Dismantling, modification & re-erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY ERECTED BY OTHERS at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, repair of damaged portion of primer as per Sl No 3.1 of Table 3 of Standard Specification for Surface Preparation and Protective Coating Document No. 6-79-0020 (or as per Job Specification, wherever applicable), grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY ERECTED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	1	MT		54700	54700
2408	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.1.MD1308	Dismantling, modification & re-erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY ERECTED BY OTHERS at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, repair of damaged portion of primer as per Sl No 3.1 of Table 3 of Standard Specification for Surface Preparation and Protective Coating Document No. 6-79-0020 (or as per Job Specification, wherever applicable), grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY ERECTED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	1	MT		65000	65000
2409	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3	General Steel Works - Non FIM Items					
2410	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1303	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (confirming to IS:2062) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer(1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		131770	131770
2411	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1304	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (confirming to IS:2062) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		142100	142100
2412	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1305	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (conforming to IS:2062 at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer(1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT) , as per EIL Specification No. 6-79- 0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		132960	132960

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2413	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1306	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (conforming to IS:2062 at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT) , as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		143290	143290
2414	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1313	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		134020	134020
2415	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1314	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		144340	144340
2416	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1315	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062 at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79- 0020 (or as per Job Specification, wherever applicable) after fabrication etc.. all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	330	MT		136930	45186900
2417	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.3.MD1316	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062 at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc.. all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	5	MT		147250	736250

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2418	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4	Painting - Non FIM Items					
2419	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4.MD1308	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 5.2 of Table 5 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the coat of shop primer already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of shop primer coat as per Sl. No. 3.1 of Table 3 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable), for steel structures (excluding hand rails) at all location & levels, all complete as specified, for OFFSITE (INLAND) areas. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on structural steel weight).	16500	MT		13740	226710000
2420	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4.MD1311	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 4.1 of Table 4.0 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) for painting(including primer) over the galvanisation already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of galvanisation (as per notes of table 4 of EIL specification no. 6-79- 0020 or as per Job Specification, wherever applicable), for HAND RAILS at all location & levels, all complete as specified. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on weight of steel).	125	MT		14650	1831250
2421	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4.MD1312	Supplying and applying COATING (Post erection/Field) of approved quality and shade as per Sl. no. 5.2 of Table 5 of EIL specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the damaged area requiring repair/rectification, including storage, surface preparation as per ST.2, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc., for all steel structures (excluding handrails) at all location & levels all complete as specified, in OFFSITE (INLAND) areas. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on surface area in Sqm)	20	sqm		550	11000
2422	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4.MD1314	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. no. 4.1 of Table 4 of EIL specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the damaged area requiring repair/rectification, including storage, surface preparation as per ST.2, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. for HANDRAIL at all location & levels, all complete as specified. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on surface area in Sqm)	10	sqm		480	4800
2423	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.4.MD1315	Supply and Applying Anti-carbonation paint including primer, intermediate and final coats after surface preparation including storage, degreasing, drying providing temporary staging, scaffolding, inspection and testing etc. on all concrete surfaces in superstructure as specified in Doc no. No. B957-000-06-42-PLS-01.	1000	sqm		720	720000
2424	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.6	Barricading Structure - Non FIM Item					
2425	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.4.6.1	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS FOR BARRICADING, of Grade E250A / E250BR / E250B0 (conforming to IS:2062) and/ or CFSHS/ CFRHS of Grade YSt 310 (conforming to IS:4923) and/ or CFCHS of Grade YSt 310 (conforming to IS:1161) at all locations and levels, including all built-up sections/ compound/ hollow/ tubular sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks for isolating the construction area, cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Non-shrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting and applying pre-erection/ shop primer as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., AND maintaining the structure during project execution AND dismantling, removing & taking away all materials outside the plant boundary after completion of the project, to the complete satisfaction of Engineer-in-charge all complete as per the direction of Engineer-in-Charge. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	10	MT		63860	638600
2426	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.5	STRUCTURAL STEEL WORKS (TUBULAR/HOLLOW SECTION) (REFER SPECIFICATION NO.6-68-0007)					
2427	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.5.9	Yst 355 IS 4923					
2428	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.5.9.MD1303	Supplying, transporting, storing, fabricating, erecting in position & testing/examining at all locations and levels, bolted and/or welded STRUCTURAL STEEL WORKS of all types using "COLD FORMED (RECTANGULAR/SQUARE) HOLLOW SECTIONS conforming to IS: 4923, Grade Yst-355 of approved make" in all type of trusses, purlins, girders, side rails, columns, runners, beams, ties, portals, framework, bracing, brackets, sag rods etc. including all handling straightening/bending if required, cutting to required size & shape, edge preparation, welding & bolting of joints, providing and fixing end caps and plugging holes, fixing in line and level with necessary temporary staging and removal of the same after erection, grouting with Ordinary/ premix free flow Non- Shrink Grout as specified, preparation and submission of detailed fabrication drawings, preparing the exposed surfaces for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) etc. all complete as specified and directed (SUPPLY OF ALL MATERIALS INCLUDING PLATES IN CONTRACTOR'S SCOPE).	210	MT		156940	32957400
2429	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6	MISCELLANEOUS STEEL WORKS SPECIFICATIONS NO. 6-68-0008					
2430	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.1	Anchor Bolts - FIM Items					
2431	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.1.2	Fixing and keeping in position at all levels and locations already fabricated THREADED ANCHOR BOLTS of all diameters and nomenclature supplied by the owner as Free Issue including nuts, washers, anchor plates, pipe sleeves etc. in foundations, columns, pedestals, slabs, beams, walls etc. or any other place as directed including transporting the same from owner's store/issue points to site of work handling , straightening if required, turning from relevant size M.S. rounds to required diameter, threading, welding, providing necessary templates and auxiliary dummy structures, if any, necessary tying and welding with reinforcement, adjustment of shuttering & reinforcement/any other fixture, greasing exposed metal surfaces, covering bolts and packing the sleeves with jute cloth etc. all complete as specified and directed. (BOLTS SHALL BE SUPPLIED BY THE OWNER AS FREE ISSUE) .	0.5	MT		30360	15180
2432	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.15	Anchor Bolts - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2433	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.15.1	Supplying, fabricating, fixing and keeping in position at all levels and locations THREADED ANCHOR BOLTS of all diameters and nomenclature including nuts, washers, anchor plates, pipe sleeves etc. in foundations, columns, pedestals, slabs, beams, walls etc. or any other place as directed including handling & transporting, straightening if required, turning from relevant size M.S. rounds to required diameter, threading, welding, providing necessary templates and auxiliary dummy structures, if any, necessary tying and welding with reinforcement, adjustment of shuttering & reinforcement/any other fixture, greasing exposed metal surfaces, covering bolts and packing the sleeves with jute cloth etc. all complete as specified and directed.(SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	5	MT		137670	688350
2434	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.16	MS Metal Inserts - Non FIM Items					
2435	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.16.1	Supplying, transporting, storing, fabricating and fixing in position M.S. METAL INSERT (with lugs) of any shape made out of flats, plates, rolled sections, pipes etc. providing necessary templates, staging, cutting, straightening, if required, bolting, welding as required and embedding in position on both Plain and Reinforced Cement concrete members inclusive of adjusting shuttering & reinforcement/ any other fixture, welding where necessary, tying and holding to correct level, line and position, any auxiliary dummy structures to support the heavy inserts, painting exposed surfaces with a coat of primer as per EIL Specification No. 6-79-0020 (or as per Job Specification wherever applicable), etc. all complete for all depths and heights as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	2	MT		144410	288820
2436	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.17	GI Pipe Sleeves - Non FIM Items					
2437	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.17.1	Supplying, fabricating and fixing in position G.I. PIPE SLEEVES of all diameters including providing necessary staging, cutting, straightening if required, bolting, welding as required and embedding in position on both Plain and Reinforced Cement concrete members inclusive of adjusting shuttering & reinforcement/any other fixture, welding where necessary, tying and holding to correct level, line and position, any auxiliary dummy structures to support heavy sleeves etc. all complete for all depths and heights as specified and directed.	0.5	MT		131740	65870
2438	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.18	MS Chequered Plates - Non FIM Items					
2439	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.18.1	Supplying, fabricating and erecting in position at all levels and locations bolted, screwed and/or welded M.S. CHEQUERED PLATES of any thickness in walkways, platforms, stair treads, any other place as directed etc. including cutting to required size, shape, making holes, notches, openings of required size, nosing, straightening if required, making the edges smooth, removing the burrs, fixing, welding, preparation and submission of fabrication drawings and preparing the surfaces for painting and applying shop primer as per EIL Specification No. 6-79-0020 (or Job Specification, wherever applicable) after fabrication etc. all complete as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	0.5	MT		141520	70760
2440	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.19	MS Grating Cat. A,B - Non FIM Items					
2441	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.19.6	Supplying, fabricating and erecting in position at all levels and locations ELECTROFORGED HOT-DIP GALVANISED GRATING (purchased from approved manufacturer by the Contractor) conforming to EIL Standard No. 7-68-0697 (in walkways, platforms, stair treads etc.) including cutting to required size, shape, making holes, notches, openings of required size, nosing, straightening if required, making the edges smooth, removing the burrs, fixing with manufacturer's supplied Hot-dip galvanised clamps, preparation and submission of fabrication drawings, all complete as specified and directed. SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE.	15	MT		138560	2078400
2442	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.19.7	Making openings in galvanized grating for pipes / ducts etc., at all levels and at at all locations by cutting the existing grating and providing 50x6 galvanised flat as toe protection for the openings by welding and application of galvanized paint as per EIL Standard No. 7-68-0697, all complete. Payment shall be made as per number of openings.	50	each		1460	73000
2443	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.22	MS Rungs - Non FIM Items					
2444	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.22.1	Supplying, fabricating, fixing and keeping in position M.S. RUNGS in R.C.C. works at all depths and heights including handling, transporting the steel to site workshop and site of work, straightening, if required, cutting, bending to shape, necessary tying and welding with reinforcement, adjustment of shuttering, cleaning, surface preparation, shop primer as per EIL Spec. 6-79-0020 (or Job Specification, wherever applicable) and two coats of anticorrosive paint of approved quality on the exposed portion of rungs etc. all complete as specified and directed (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	25	kg		100	2500
2445	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.23	Hand Railing 1000mm - Non FIM Items					
2446	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.23.MD1301	Supplying, fabricating and fixing in position at all locations 1000mm high INCLINED HAND RAILING (for staircases) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade M.S. Tubes conforming to IS:1239 including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable) , preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	225	m		1940	436500
2447	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.23.MD1303	Supplying, fabricating and fixing in position at all locations 1000mm high HORIZONTAL HAND RAILING (for platforms, walkways, etc. or any other location as directed) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade MS Tubes conforming to IS:1239 and 100x5 MS Toe Plate confirming to IS:2062 (Grade A/B), including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable), preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	600	m		1830	1098000
2448	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.24	Hand Railing 500mm - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2449	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.24.MD1301	Supplying, fabricating and fixing in position at all locations 500mm HIGH INCLINED HAND RAILING (for stair cases) consisting of top rail & vertical posts (maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade M.S. Tubes conforming to IS:1239 including straightening if required, cutting, bending, welding, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79 -0020 (or as per Job Specification, wherever applicable), preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	10	m		970	9700
2450	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.24.MD1302	Supplying, fabricating and fixing in position at all locations 500mm high HORIZONTAL HAND RAILING (for platforms, walkways, etc. or any other location as directed) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade MS Tubes conforming to IS:1239 and 100x5 MS Toe Plate confirming to IS:2062 (Grade A/B), including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable) , preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	20	m		890	17800
2451	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.25	Mechanical Anchor fastners - Non FIM Items					
2452	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.25.1	"Supplying, handling, transporting to site of work and fixing approved MECHANICAL ANCHOR FASTENERS M.S. bolts of Grade 5.8 or more, GALVANIZED with minimum thickness of 5 microns (approved for use in cracked concrete), of 12mm dia at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush, and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	25	each		480	12000
2453	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.25.2	"Supplying, handling, transporting to site of work and fixing approved MECHANICAL ANCHOR FASTENERS M.S. bolts of Grade 5.8 or more, GALVANIZED with minimum thickness of 5 microns (approved for use in cracked concrete), of 16mm dia at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush, and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	10	each		880	8800
2454	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.26	Chemical Anchor Fastner					
2455	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.26.1	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 12mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	25	each		1840	46000
2456	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.26.2	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 16mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	50	each		2270	113500
2457	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.26.3	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 20mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	100	each		2800	280000
2458	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.26.4	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 24mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	100	each		3490	349000
2459	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.27	Threaded bolts for equipment fixing-Non FIM					
2460	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.6.27.1	Supplying, fabricating, fixing and keeping in position at all levels and locations THREADED BOLTS of Grade C property class 4.8 as per IS:1363 (part 2) of all diameters and length including nuts, washers for supporting equipment on steel structure as directed including handling & transporting, straightening if required, turning from relevant size M.S. rounds to required diameter, threading etc. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	0.5	MT		143600	71800

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2461	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7	BRICK MASONRY (REFER SPECIFICATION NO.6-68-0009)					
2462	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7.9	CLASS 5.0 at all depths -Non FIM Items					
2463	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7.9.1	Providing and laying BRICK MASONRY WITH BRICKS OF CLASS 5.0 in cement mortar 1:6 (1 Cement : 6 Sand) in one or more brick thickness and in any shape (excluding circular/curved brick masonry) at all depths below plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of bricks, cutting and laying of bricks, providing recesses, making openings of any shape & size, finishing the joints flush below ground level and raking out the joints above ground level, sealing the gap between masonry and soffit of beam/slab, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		9960	19920
2464	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7.9.2	Providing and laying BRICK MASONRY WITH BRICKS OF CLASS 5.0 in cement mortar 1:6 (1 Cement : 6 Sand) in one or more brick thickness and in any shape (excluding circular/curved brick masonry) at all heights above plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of bricks, cutting and laying of bricks, providing recesses, making openings of any shape & size, finishing the joints flush below ground level and raking out the joints above ground level, sealing the gap between masonry and soffit of beam/slab, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		10650	10650
2465	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7.11	HALF BRICK MASONARY with bricks of CLASS 5.0-Non FIM Items					
2466	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.7.11.1	Providing and laying HALF BRICK MASONRY with bricks of CLASS 5.0 in cement mortar 1:4 (1 Cement : 4 Sand)in any shape, including the cost of materials, labour, scaffolding/staging, sampling and testing, soaking of bricks, cutting and laying of bricks, providing openings of any shape & size, raking out the joints, supplying and placing 2 Nos. 6mm dia. M.S. Bars at every fourth course, sealing the gap between masonry and soffit of beam/slab, embedding the fittings and fixtures, curing etc. all complete as per specification. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY CONTRACTOR.	10	m^2		1230	12300
2467	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10	DEMOLISHING AND DISMANTLING (REFER SPEC NO. 6-68-0012)					
2468	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.1	Brickwork - Non FIM Items					
2469	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.1.1	Demolishing BRICKWORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	0.5	m^3		1800	900
2470	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.1.2	Demolishing BRICKWORK (taking all necessary safety precautions) for all heights above plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	0.5	m^3		1960	980
2471	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2	RCC - Non FIM Items					
2472	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.1	Demolishing RCC WORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, straightening, scraping and cleaning of reinforcement bars, stacking of serviceable materials, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	2	m^3		2530	5060
2473	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.2	Demolishing RCC WORK (taking all necessary safety precautions) for all heights above plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, straightening, scraping and cleaning of reinforcement bars, stacking of serviceable materials, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	0.5	m^3		2710	1355
2474	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.3	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, upto & inclusive of 25mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m^2		580	1160
2475	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.4	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, beyond 25mm and upto & inclusive of 50mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m^2		730	1460
2476	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.5	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, beyond 50mm and upto & inclusive of 100mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m^2		1130	2260
2477	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.6	Chipping of RCC WORK (taking all necessary safety precaution) by CHISELLING for thickness more than 100mm for all depths below plinth level including supply of all tools & tackles, scaffolding, propping, underpinning, etc. exposing, cutting, lapping/welding the reinforcement bars as per drawings & cleaning the same by wire brushing, washing the exposed surfaces, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m^3		4530	9060
2478	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.7	Chipping of RCC WORK (taking all necessary safety precaution) by CHISELLING for thickness more than 100mm for all heights above plinth level including supply of all tools & tackles, scaffolding, propping, underpinning, etc. exposing, cutting, lapping/welding the reinforcement bars as per drawings & cleaning the same by wire brushing, washing the exposed surfaces, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	2	m^3		4990	9980
2479	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.11	Making cut-outs in RCC slab/ wall upto a thickness of 400mm (taking all necessary safety precautions) by vibration-less spark-free mechanical means like core-cutting, wet cutting by diamond wall saw system at all depths & heights including supply of all tools & tackles, necessary scaffolding etc. cutting of reinforcement bars, disposal of unserviceable material, plastering & finishing the cut surfaces, all complete as specified and directed by the Engineer-in- Charge (Measurement on Plan/ Elevation Area basis).	2	m^3		15450	30900

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2480	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.12	Cutting/ Dismantling RCC work in pavement, slabs, beams, columns, etc upto a depth of 450 mm by using vibration-less spark-free Diamond Saw Cutter of make HILTI (or equivalent) at all depths & heights, in hazardous areas within process units & offsite which are fire prone due to presence of hydrocarbon vapours etc. taking elaborate precautions for dismantling as per fire permit, clearance etc. and work is to be done with extreme caution. The work item includes cost of all necessary accessories, tools & tackles including diamond saw cutter, disposal of RCC Debris upto lead of 100 m & for all lifts (taking all safety precautions) including cutting reinforcement bars, embedded structural steel members, with necessary scaffolding, propping and underpinning etc. for all elevations with all labour and materials, all complete as per drawings, specifications and directions of the Engineer-in-charge. Payment will be made per sq.m.of cross-sectional cut area. Contractor to submit dismantling plan prior to start of dismantling. Dismantling shall be planned in such a way that each cut piece shall weigh not less than 1.6 MT.	2	m²		10380	20760
2481	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.2.13	Cutting/ Dismantling of RCC block foundations, raft foundations, pile caps, mass concrete, equipment foundations etc. by using vibration-less spark-free Diamond Wire Saw Cutter of make HILTI (or equivalent) at all depths & heights, in hazardous areas within process units & offsite which are fire prone due to presence of hydrocarbon vapours etc. taking elaborate precautions for dismantling as per fire permit, clearance etc. and work is to be done with extreme caution. The work item includes cost of all necessary accessories, tools & tackles including diamond saw cutter , disposal of RCC Debris upto lead of 100 m & for all lifts (taking all safety precautions) including cutting reinforcement bars, embedded structural steel members, with necessary scaffolding, propping and underpinning etc. for all elevations with all labour and materials complete as per drawings, specificationsand directions of the Engineer-in-charge. Payment will be made per sq.m.of cross-sectional cut area. Contractor to submit dismantling plan prior to start of dismantling. Dismantling shall be planned in such a way that each cut piece shall weigh not less than 1.6 MT.	2	m²		11030	22060
2482	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.3	Pockets - Non FIM Items					
2483	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.3.1	Making POCKETS/HOLES of sizes upto & inclusive of 200 x200x500mm in RCC/PCC works (taking all necessary safety precautions) by chiselling/drilling, including supply of all tools & tackles, necessary scaffolding etc. cutting of reinforcement bars, cleaning the pockets of all debris, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary all complete at all heights & depths as specified and directed.	5	each		530	2650
2484	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.4	PCC _ Non FIM Items					
2485	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.4.1	Demolishing PLAIN CEMENT CONCRETE work (taking all necessary safety precautions) for all depths below plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc. disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation and backfilling shall be paid separately under relevant items)	5	m³		2070	10350
2486	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.5	Stonework - Non FIM Works					
2487	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.5.1	Demolishing STONE MASONRY WORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	25	m³		2090	52250
2488	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.6	Steelwork - Non FIM Items					
2489	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.6.1	Dismantling bolted/rivetted/welded STRUCTURAL STEEL WORK of all descriptions (taking all necessary safety precautions), including supply of all tools and tackles, consumables, necessary scaffolding etc., providing temporary bracings as required, cutting (by flame or saw) gusset plates, bolts, nuts, weldings etc., transporting and stacking of the serviceable materials, cleaning the site of work of all unserviceable materials for disposal to spoil heaps anywhere within the plant boundary, all complete at all depths and heights, as specified and directed.	0.5	MT		12630	6315
2490	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.7	AC / GI Sheets - Non FIM Items					
2491	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.10.7.1	Dismantling GI/asbestos/translucent sheets, ridges, gutters etc. (taking all necessary safety precautions) in roofings and wall claddings, including supply of all tools & tackles, necessary scaffolding, consumables, cutting (by flame or saw) of fixing hooks, transporting and stacking the serviceable materials, cleaning the site and disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete for all levels, as specified and directed.	5	m²		150	750
2492	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11	MISCELLANEOUS ITEMS (REFER SPECIFICATION NO. 6-68-0013)					
2493	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.6	Sand Filling - Non FIM Items					
2494	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.6.1	Supplying and filling approved SAND of specified quality under floors, in foundations, plinths, tank foundations etc. for all depths and heights including cost of sand, royalties, transportation to site for all leads and lifts, including loading, unloading, spreading in layers of loose thickness not exceeding 150 mm, watering, ramming, compacting with mechanical compactors and/or other equipment to the specified levels to achieve 85% relative density as per IS:2720 Part XIV, including preparation of subgrade to the required slope, providing testing apparatus and testing the degree of consolidation all complete as per drawings, specifications and direction of Engineer-in-charge. The rates shall be inclusive of the cost of all labour, material, equipments etc. all complete .	10	m³		3440	34400
2495	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.8	Bitumen - Non FIM Items					
2496	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.8.1	Supplying and applying one coat of HOT BITUMEN VG10 grade conforming to IS:73 @1.5 Kg/sq.m. on Concrete/Brick work surfaces etc. all complete as specified and directed.	2	m²		100	200
2497	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.8.2	Extra over item 01CS.11.8.1 for each additional coat of HOT BITUMEN VG10 grade @ 1.2 Kg/sq.m. on Concrete/Brick work surfaces etc. complete.	2	m²		80	160
2498	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.10	BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE					
2499	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.11.10.1	Supplying and mixing of approved brand of BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE (confirming to EIL Specification No. 6-68-0017) in concrete as per manufacturer's specification for protection of reinforcement against corrosion. Supply of admixture in Contractor's scope.	1000	kg		220	220000
2500	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.14	BONDING FRESH CONCRETE TO OLD CONCRETE BY EPOXY RESIN BONDING SYSTEM (REFER SPECIFICATION NO. 6-68-0056)					
2501	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.14.1	Epoxy Resin - non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2502	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.14.1.1	Providing and applying approved EPOXY RESIN (prepared as per manufacturer's recommendation) for bonding of fresh concrete to old concrete in all types of structure at all depths and heights including cleaning of concrete surface, removing of all loose concrete pieces, making rough by chiselling, taking off the skin of concrete, application of Epoxy Resin System by spraying, necessary working platforms, props, scaffolding and other safety measures, removal of same after completion etc. all complete as specified and directed. (Excavation, backfilling, removal of surplus earth, keeping pit dry by pumping/bailing subsoil water shall be paid separately under relevant items).	100	kg		1350	135000
2503	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17	FIREPROOFING OF STEEL STRUCTURES (REF SPEC NO 6-68-0033)					
2504	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.11	Concrete - Non FIM Items					
2505	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.11.1	Supply and laying of concrete of grade M30 as per Type-I of EIL Standard Specification 6-68-0033 as fire proofing material with 10 mm and down size graded coarse and fine aggregates including admixture around structural steel members (viz. beams, columns, bracings etc.) all complete; cleaning the steel surfaces, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, vibrating, tamping, curing or providing a layer of approved membrane of curing compound, rendering with cement sand mortar (1:3) wherever required to achieve a smooth and even surface, providing L50x50x6 at corners or as specified in the drawing, applying primer on MS nuts, angles and affected surfaces, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights upto & including 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS INCLUDING CEMENT TO BE SUPPLIED BY THE CONTRACTOR).	500	m²		3290	1645000
2506	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.12	Vermiculite Concrete for Structural Steel - Non-FIM Items					
2507	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.12.1	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-II of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness around structural steel members (viz. beams, columns, bracings etc.) for the required fire protection from reaching temperature 538 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, applying primer on MS nuts and affected surfaces, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights upto & including 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	2500	m²		4750	11875000
2508	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.12.2	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-II of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness around structural steel members (viz. beams, columns, bracings etc.) for the required fire protection from reaching temperature 538 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, applying primer on MS nuts and affected surfaces, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights more than 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	50	m²		5020	251000
2509	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.13	Vermiculite Concrete for Equipments - Non-FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2510	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.17.13.1	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-III of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness on equipment/ vessel skirts, saddles and supports for the required fire protection from reaching temperature 427 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062, hot dipped galvanized welded wire fabric reinforcement of 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566 and tying the reinforcement with the pre welded nuts by galvanized 16 SWG tying wire, including straightening, cutting, bending of the reinforcement, including supplying and welding of additional MS nuts if directed by the Engineer-in-charge, applying primer wherever required, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	60	m²		5710	342600
2511	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.18	Mechanical works					
2512	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.18.5	Supplying, fabricating and erecting in position MS plates as per detailed drawings, conforming to grade A of IS:2062 on top of all RCC pedestals supporting the sliding saddles of equipments, including cutting, straightening where necessary, rounding rounding unfinished edges by grinding, machining the exposed top surface, making necessary bolt holes, providing and laying ready mixed free flow non-shrink grout below the base plate at all levels & locations, machining top surfaces etc. all complete and as shown and directed.	0.5	MT		141520	70760
2513	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.18.9	Dismantling Of steel works					
2514	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.18.9.1	Dismantling structural steel already erected by others including provision of adequate temporary supports, bracings etc. wherever required, to ensure safety of the affected structure or part thereof, and replacing back all original members into their respective positions true to line and level, removing all temporary supports/bracings, welding/bolting of the end connections, splicing or strengthening the member and their joints to regain original strengths, all complete as directed by the Engineer-in-Charge. Note: The weight of dismantled and re- erected structure shall be measured only once.(SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE)	1	MT		12630	12630
2515	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.23	SAFETY (REFER EIL SPECIFICATION)					
2516	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.23.1	Safety Structures - Non FIM Items					
2517	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.23.1.1	Supplying, Transporting, Storing, Fabricating & Erecting in position and testing/ examining bolted and/ or welded Structural Steel Works at all locations and levels in HANGER SCAFFOLDING below piperack, comprising of hangar channels, fabricated pen wen ladder beams, steel planks bent to shape and size and any other sections, if required, all as per sketches/ specifications and load tested for statisfactory performance, including cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, including preparation and submission of detailed fabrication drawings, preparing the surface for painting as per BIS codes after fabrication etc. all complete as specified and directed. All items shall be removed & carried back by Contractor as per instructions of Engineer-in-Charge after completion of works. (Supply of All Material In Contractor's Scope).	50	m²		2430	121500
2518	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.23.1.3	Providing and fixing double scaffolding system of any height made with 40 mm dia MS tube 1.5 m centre to centre, horizontal & vertical tubes joining with MS tubes, MS tube challies, MS clamps and MS staircase system in the scaffolding for working platform/ staircase etc., and maintaining it in a serviceable condition for the required duration as approved and removing it thereafter. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc., wherever required for inspection of work at required locations with essential safety features for the workmen etc., all complete as per directions and approval of Engineer-in-charge. (Height shall be measured from Floor/ platform from where scaffolding is erected) including providing Aluminium ladders for safe acess of workers.	1000	m³		110	110000
2519	A	B957-999-81-41-PK-SOR-9501-A-3M	01CS.23.1.4	Providing of steel scaffold stair tower system with minimum 800 mm wide flights, landings at every 1.5 to 2.0 m height, handrailing around flights and landings for safe access upto a height of 12.0 m, all complete including supply of all materials, tools & tackles, manpower etc., at the location directed by Engineer-in-Charge on monthly rental basis. Rental charges shall be payable after completion of erection of the system and acceptance by the Engineer-in-Charge. Rates shall also be inclusive of dismantling of the system and taking out all materials from the project permises as directed by the Engineer-in-Charge. Rate quoted shall be for Running Meter (Height) per month.	100	RM		5670	567000
2520	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC	GENERAL CIVIL					
2521	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.2	Compound wall/ Chain Link Fencing/ Barbed wire fencing works					
2522	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.2.5	Supplying, fabricating and fixing G.I. chain link fencing with 3.15mm dia. wire, 50x50mm diamond mesh chain link fence fabric conforming to IS:2721 fixed to steel/RCC posts/struts above ground level or above short height compound wall (height upto 1.5m), including supply of chain link fencing fabric in 1.9 metre wide rolls, stretcher bars, staples, etc. required for fixing the fencing, fixing of chain link fencing between straining posts, fixing of bottom of fencing to a concrete sill beams by means of hairpin staples, including supply and fixing line wires, complete as per drawings, specifications and directions of Engineer-in-Charge (All materials shall be supplied by Contractor). (The measurement of chain link fencing shall be on linear basis for 1.9 m wide fencing fabric)	500	m		1430	715000
2523	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7	CONCRETE PAVEMENTS					
2524	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.2	Providing and laying Reinforced Cement Concrete with 20mm and down size graded crushed stone aggregates in flooring, pavements etc. including leaving pockets, if necessary, making recess/drains, laying in alternate panels, etc. for all depths including shuttering, tamping, curing, etc. as specified in any shape, thickness, position and finishing the top surface smooth etc. all complete as per drawings, specifications and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2525	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.2.2	For RCC of M-30 grade concrete (all materials including cement but excluding cost of providing & fixing reinforcement and joint sealing shall be supplied by the contractor).	400	m³		9870	3948000
2526	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.6	Supplying and laying of 150 micron thick HM HDPE (Grade-I) FILM lining conforming to IS 10889 below concrete pavements, Hard stand, at any other place etc. including royalties, taxes, handling, transportation, unloading, storage, joining etc. all complete as per drawings, manufacturer's specifications and directions of Engineer-in-charge.	2500	m²		140	350000
2527	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.7	Supply of all materials and Construction of DRY LEAN CEMENT CONCRETE SUB-BASE (7 days compressive strength of 10.0 MPa) with 26.5mm and down size aggregate including cement , water, and approved additives on a prepared sub-grade, mixed in batching plant, transported to site, for all leads & lifts, laid, compacted, finished and cured etc. complete as per IRC:SP:49 (Guidelines for the use of Dry Lean Concrete as Sub-Base), drawings, standards, specifications and directions of Engineer-in-charge.	200	m³		4130	826000
2528	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.10	Providing 20mm wide Expansion Joints in pavement slabs as per standard/ drawing including cleaning the joints of all loose material, filling with 20mm thick impregnated fibre boards for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. all complete as per drawings, specifications and directions of Engineer-in-Charge.					
2529	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.10.1	For type-I pavement (Upto and inclusive of thickness of 200 mm). (Including providing and laying MS dowel bar, painting as required, GI pipe and cap and cotton waste).	100	m		1870	187000
2530	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.10.3	For type-II pavement (Upto and inclusive of thickness of 150 mm)	100	m		290	29000
2531	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.10.4	For type-III pavement (Upto and inclusive of thickness of 100 mm).	50	m		230	11500
2532	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.11	Providing joints in pavements and around foundations as per standard/ drawing including cleaning the joints of all loose materials and sealing with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge for.					
2533	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.11.1	Construction joints 20mm wide x 25mm deep.	100	m		370	37000
2534	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.11.2	Sealing joint around pedestal and column etc. 20mm wide x 200 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge.	350	m		580	203000
2535	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.11.3	Sealing joint around pedestal and column etc. 20mm wide x 150 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge.	350	m		520	182000
2536	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.7.11.4	Sealing joint around pedestal and column etc. 20mm wide x 100 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge for.	150	m		460	69000
2537	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15	MISC. CIVIL AND STRUCTURAL WORKS FOR U/G PIPING AND OTHER CIVIL WORKS					
2538	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15.1	Providing and laying brick masonry with locally available bricks of specified class (Brick of class lower than specified shall not be accepted) in cement mortar 1:4 (1 cement : 4 Coarse sand) in one or more brick thickness and in any shape in foundation and plinth for valve pits, drains, circular/square maholes, wing walls, etc. including providing recesses, openings, etc. including curing, finishing the joints flush below ground level and raking out joints in plinth with all labour and material, etc. complete as per drawings, specifications and direction of Engineer-in-Charge. For following Brick Class.					
2539	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15.1.1	Cement supplied free of cost by the Owner and following Brick Class					
2540	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15.1.1.1V1	Brick Class 5	625	m³		10250	6406250
2541	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15.2	Providing 13mm thick average cement plaster in cement mortar 1:3 (1 cement: 3 sand) on brick walls/stone masonry/pitching or on concrete surfaces for manholes, valves pits, culverts, wing walls, etc. including cleaning and preparation of the surface, scaffolding, curing etc. for all depths and heights complete as per drawings specifications and direction of Engineer-in-Charge.					
2542	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.15.2.2	All materials including cement supplied by the Contractor.	700	m²		400	280000
2543	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26	MISCELLANEOUS ITEMS					
2544	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.10	Supply and installation of combined safety shower and eyewash units as per spec. no.6-66-0038, including providing and fixing of necessary foundation bolts in foundations/ pavement etc. complete. Each safety shower shall have proper sign board with florescent letters showing their location, all complete as per specification, drawings and direction of Engineer-in-charge.	5	each		47690	238450
2545	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11	Lining/Pitching					
2546	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11.1	Providing and laying 100 mm thick cement concrete lining of M-20 grade with 20mm and down size graded stone aggregates for embankments, road side slopes holding ponds bunds, drains, tank pad, channels or at any other place as directed, including laying cement concrete in alternate panels, shuttering the edges, curing, finishing the top surface rough or smooth complete as per drawings, specifications and directions of Engineer-in-Charge.					
2547	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11.1.3	On horizontal surfaces (All materials including cement supplied by contractor)	100	m²		890	89000
2548	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11.1.4	On sloped surfaces (All materials including cement supplied by contractor)	100	m²		980	98000
2549	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11.2	Providing 20mm wide x 25mm deep contraction joint in lining etc. including cleaning the joints of all loose materials and filling with approved mastic filler conforming to IS:13413, Cleaning joints, applying primer as per IS:5256, clearing the adjoining surface after sealing etc. complete as per drawings, specifications and the directions of Engineer-in-Charge.					
2550	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.11.2.1	For lining depth of 100mm	100	m		250	25000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2551	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.17	Supplying and fixing in position CI sluice Gates with frames as per IS:13349 and as per specifications and drawings including transportation to site of work, supplying and fixing bolts, nuts, washers, gaskets etc. complete as per drawings, specifications and directions of Engineer-in-Charge. For following Size(mm) and Type and Class					
2552	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.17.1V8	Square 1200 mm Class - 1	6	nos		321360	1928160
2553	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.17.1V15	Square 2000 mm Class - 1	2	nos		893010	1786020
2554	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.28	Supply and installation of expansion bellow as per specification comprising of rubber expansion bellow in position including transportation of the material to work site, as per directions of Engineer-in-Charge. For following nominal size and piping class					
2555	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.28.1V21	Dia 52 Inch Piping Material Class A3A	22	nos		428480	9426560
2556	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.28.1V22	Dia 24 Inch Piping Material Class A3A	4	nos		197760	791040
2557	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30	Complete work for laying of Double walled corrugated (DWC) HDPE pipes as per IS 16098 Part 2 under roads/ drain crossings for maximum depth of 2m measured from top of DWC pipe upto road top level in all types of soil excluding soft rock and hard rock using HDD (Horizontal Directional Drilling) method using machine including supply of all materials, machinery, manpower etc. complete including cutting and jointing of the pipe as per manufacture's specification required for completion of the job as per directions of Engineer-in-Charge for the following internal diameter (DN) of the pipe - (Length of HDD will be straight length measured between entry and exit point)					
2558	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.1	Dia 160 mm	100	m		16690	1669000
2559	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.2	Dia 200 mm	100	m		22250	2225000
2560	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.3	Dia 400 mm	100	m		44500	4450000
2561	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.4	Dia 500 mm	50	m		55620	2781000
2562	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.5	Dia 600 mm	50	m		66740	3337000
2563	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.26.30.6	Dia 800 mm	50	m		88990	4449500
2564	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.36	Portable/ trolley mounted Extinguishers					
2565	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.36.1	Supply and installation of portable DCP (Dry Chemical Powder Type) extinguisher including transporting to worksite, fixing in position including all accessories and all labor and material etc. complete as per drawings, specification and directions of Engineer-in-Charge.					
2566	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.36.1.1V1	Capacity in Kg 9	25	nos		3560	89000
2567	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40	Fabrication and Erection of piping (underground)					
2568	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20	Laying and joining of externally 3L PE pre-coated Carbon Steel pipes and specials underground including transportation of all material from Owner's storage point to worksite, earthwork in excavation in all types of soils excluding soft rock and hard rock, for pipe trenches, saddles, etc. including dewatering, shoring and strutting if required, dressing of sides, levelling, grading and ramming of bottoms, cutting of pipes to required lengths if required, edge preparation, laying the pipes in trenches to required alignment and levels, welding the same after laying, installation of flanges, blind flanges, tapping for pressure gauges, temperature gauges and all other online instruments, fixing of nuts, bolts, gaskets and washers, welding, carrying out repairs of coating defects not attributed to owner (i.e. defects occurring after taking over of pipes from owner), coating of all field weld joints etc. as per specification, including supply of coating material for field joints,inspection and testing for the corrosion protection coating as per specification, cutting of road wherever required and making good the same,hydrostatic testing of the system, flushing, backfilling the trenches with select material from available excavated soil including re-excavating the deposited soil excavated earlier, breaking clods and laying in layers of 15 cm compacted thickness, watering, compacting with mechanical means like vibro rammers etc. to 90% of dry density as per IS:2720 Part- VII or 85% relative density as per IS: 2720 Part XIV as applicable, making good the surface, disposal of surplus earth/ unserviceable material to demarcated area anywhere within the complex limit etc. complete as per drawings, specifications and instructions of Engineer-in-Charge including connecting the pipes to manhole, including return of all unused / scrap pipes and specials to owner's storage point (All the materials except Pre-coated Pipes and fittings shall be supplied by contractor)(Pre-coated Pipes and fittings shall be issued free of cost by Owner.) (Depth of excavation for pipe trench shall be upto 3.0m)					
2569	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1	Carbon Steel Piping (Non IBR), Thickness <=10 mm					
2570	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.1	Fabrication, For the following nominal sizes					
2571	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.1.2	NB 2 inch - 6 inch	100	Inch Dia		770	77000
2572	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.1.3	NB 8 inch - 14 inch	100	Inch Dia		770	77000
2573	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.1.4	NB 16 inch - 24 inch	100	Inch Dia		770	77000
2574	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.2	Erection including corrosion protection coating of field joints, for Water System (Pressure Piping), For following Nominal Sizes					
2575	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.2.2	NB 2 inch - 6 inch	400	Inch Mtr		330	132000
2576	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.2.3	NB 8 inch - 14 inch	400	Inch Mtr		330	132000
2577	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.40.20.1.2.4	NB 16 inch - 24 inch	400	Inch Mtr		330	132000
2578	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43	Supply, fabrication and Erection of piping (Above ground)					
2579	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1	Fire water spray/ sprinkler/ detection system G.I. PIPING A/G (Screwed)					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2580	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes for Fire water spray system/ sprinkler system/ detection system as per piping material specification including supply of reducing tees, fittings, elbows, nipples, Teflon tapes, white lead etc., cutting the pipes to required lengths, making threads, including laying of pipes on pipe rack, sleepers, T-supports, erection of piping on equipments, pumps etc. including joining of pipes and fittings with threaded/flanged connections, including installation of spray nozzles, Quartzoid bulb detectors, restriction orifice, flanges, break-up flanges, gaskets and bolts, hydrostatic testing of the piping including supply of necessary fittings etc. complete as per specifications, drawings and instructions of Engineer-in-charge.(Spray nozzles, restriction orifice, flanges and break-up flanges shall be paid separately under separate SOR/ shall be given as free issue to the contractor.) For following nominal sizes and piping material class.					
2581	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1.1V9	Dia. 1 Inch PMS J2A	3270	m		800	2616000
2582	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1.1V52	Dia. 1 Inch PMS J95A	360	m		800	288000
2583	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1.1V53	Dia. 2 Inch PMS J95A	4275	m		1770	7566750
2584	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1.1V54	Dia. 3 Inch PMS J95A	65	m		2670	173550
2585	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.1.1.1V55	Dia. 4 Inch PMS J95A	330	m		3720	1227600
2586	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.3	Fire water spray/ sprinkler/ detection system G.I. PIPING A/G (Welded)					
2587	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.3.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes for Fire water spray system/ sprinkler system/ detection system as per piping material specification including supply of reducing tees, fittings, elbows, nipples, Teflon tapes, white lead etc., cutting the pipes to required lengths, welding, applying zinc silicate coating on welded joints, including laying of pipes on pipe rack, sleepers, T-supports, erection of piping on equipments, pumps etc. including joining of pipes and fittings with welded/flanged connections, including installation of spray nozzles, Quartzoid bulb detectors, restriction orifice, flanges, break-up flanges, gaskets and bolts, hydrostatic testing of the piping including supply of necessary fittings etc. complete as per specifications, drawings and instructions of Engineer-in-charge.(Spray nozzles, restriction orifice, flanges and break-up flanges shall be paid separately under separate SOR/ shall be given as free issue to the contractor.). For following nominal sizes and piping material class.					
2588	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.3.1.1V22	Nominal Dia. 6 Inch Piping Material Class J95A	700	m		6240	4368000
2589	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.43.3.1.1V23	Nominal Dia. 8 Inch Piping Material Class J95A	275	m		9120	2508000
2590	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45	Supply and installation of valve assembly, flange assembly etc.					
2591	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.1	Supply and installation of valve assembly consisting of valve, 2 no. flanges, 2 no. gaskets and 2 sets of nuts & bolts per valve assembly, erection of valve in position including fixing of nuts, bolts, gaskets, washers etc. complete as per drawings, specifications and directions of Engineer-in-Charge.					
2592	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.1.1	Gate valve assembly for following nominal sizes and piping material class					
2593	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.1.1.1V8	Dia. 1 Inch PMS J2A	5	each		5150	25750
2594	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2	Supplying the flange assembly conforming to piping material specifications and delivering the same to owner's stores/ work spot etc. Flange assembly shall consist of 2 no. flanges along with one no. matching gasket and one set of matching nuts &, bolts. All complete as per specifications and directions of Engineer-in-Charge. For following nominal size and piping material class					
2595	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V44	Dia. 1 Inch PMS J2A	5	each		1030	5150
2596	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V98	Dia. 2 Inch PMS J95A	5	each		2060	10300
2597	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V99	Dia. 3 Inch PMS J95A	5	each		3090	15450
2598	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V100	Dia. 4 Inch PMS J95A	5	each		4120	20600
2599	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V101	Dia. 6 Inch PMS J95A	25	each		6180	154500
2600	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.45.2.1V102	Dia. 8 Inch PMS J95A	25	each		8240	206000
2601	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51	fire fighting equipment's					
2602	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.2	Supply and installation of Deluge Valve skid					
2603	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.2.2	Supply, Installation, erection, testing and commissioning of Deluge Valve skid, with UL/FM listed/approved Deluge Valve (consisting of deluge valve, strainers, solenoid valve, air pressure regulator, limit switches, pressure gauge, pressure transmitters, inlet/ outlet valves, drain valve, priming valve, vent valve including alarm motor gong, fittings, local control panel, including bypass connection to deluge valve along with strainer and ball valve etc. complete) actuated through hydraulic/wet detection system including installation/placing the skid at the designated location and fixing with anchor bolts, connecting the water inlet and system piping, connecting detection network piping, fittings etc. complete for deluge valve skid as per specification, drawings and directions of Engineer-in-Charge. For following deluge valve Skid size (Inlet/ outlet/ bypass fire water line size - Deluge Valve size -)					
2604	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.2.2.1V5	Inlet/ outlet/ bypass fire water line size 6 Inch Deluge Valve size 6 Inch	1	each		905370	905370
2605	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.3	S/I Portable/ trolley mounted Extinguishers					
2606	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.3.2	Supply and installing in position, trolley mounted DCP (Dry Chemical Powder Type) extinguisher including transporting to worksite, placing in position including all accessories and all labor and material etc. complete as per drawings, specification and directions of Engineer-in-Charge.					
2607	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.3.2.1V2	Capacity 50 kg	20	nos		31210	624200
2608	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.3.5	Supply and installation of portable CO2 extinguishers including transporting to worksite, fixing in position including all accessories and all labor and material etc. complete as per drawings, specification, data sheet and directions of Engineer-in-Charge.					
2609	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.3.5.1V1	Capacity 4.5 kg	25	nos		5090	127250

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2610	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5	Supply, installation, testing and commissioning of following firefighting equipment as per relevant specifications, data sheet, drawing, including transporting the equipment to worksite, fixing of nuts, bolts, washers, gaskets, welding needed for fixing the equipment with matching flange etc. all complete as per drawings, specifications, standards, data sheet and direction of Engineer-in-Charge.					
2611	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.9	Hose box cabinet Type-II (self-supporting type) including all inside accessories, including all civil works, fixing in position with anchor bolts in foundations or wall	200	each		22650	4530000
2612	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.12	Remote operated long range water/ water cum foam monitor of 1000/1500/2000 GPM (variable) capacity on technological structure/ pipe rack/independent tower etc.	2	each		4140600	8281200
2613	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.13	Variable flow Water cum foam monitor of 500/750/1000 GPM capacity	18	each		268830	4838940
2614	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.14	Variable flow Water cum foam monitor of 1000/1500/2000 GPM capacity	13	each		396550	5155150
2615	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.15	Stand Post Type Fire Hydrant with Pumper Connection	35	each		30800	1078000
2616	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.5.16	Stand Post Type Fire Hydrant without Pumper Connection	225	each		23280	5238000
2617	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.6	Supply of medium velocity spray nozzles with 1/2" NPT fixing arrangement to Owner's storage point, testing etc. all complete as per specification, drawings, data sheet and directions of Engineer-in-Charge. For nozzle of following K factor					
2618	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.6.1V3	K factor 51	12	nos		620	7440
2619	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.6.1V9	K factor 22	110	nos		620	68200
2620	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.9	Quartzoid bulb detectors					
2621	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.51.9.2	Supply of quartzoid bulb detectors to be installed in hydraulic line with 1/2" NPT fixing arrangement including MS half coupling to Owners storage point etc. all complete as per specification, drawings, data sheet and directions of Engineer-in-Charge.at locations as per data sheets, drawings and directions of Engineer-in-Charge.	122	nos		450	54900
2622	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.99	Miscellaneous Items					
2623	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.99.01	Miscellaneous					
2624	A	B957-999-81-45-PK-SOR-9501-A-0M	01GC.99.01.ME01	Design, engineering, manufacture, procurement of equipment, materials, and bought out components including all civil, structural, electrical, mechanical, instrumentation & piping material, assembly at shop, inspection, testing at manufacturer's works, packing, transportation, delivery including supply of all mandatory spares, commissioning spares, special tools & tackles, first fill of consumables, erection material, foam tank, supporting structure, underground tank, pump etc. including unloading at site, handling, transportation to store and from store to work site, storage at site, construction, assembly at site, erection, installation, testing, pre-commissioning, painting, insulation, commissioning, performance guarantee run, handing over to client and other field works including civil, Structural, electrical, mechanical, instrumentation & piping works etc. all complete as per the enclosed scope of work & standard specifications, instructions to vendors, job specification, data sheets etc. and other codes and standards attached or referred to as per the direction of Engineer-in-charge for unloading, storage, and loading facility of Foam System in Satellite Fire Station. For detailed specification and work, refer specification no. B957-000-81-45-JS-9501	1	Lumpsum		2575000	2575000
2625	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR	ARCHITECTURE					
2626	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2	FLOOR FINISHING					
2627	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.3	50mm thick heavy duty flooring					
2628	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.3.1	Providing and laying average 50mm thick heavy duty flooring in panels consisting of base course of 35mm thick cement concrete (1 cement : 1.5 coarse sand : 3.5 stone aggregates of 10mm to 6mm size by volume) laid over sub-base and 15mm thick finishing layer consisting of cement and integral hardening compound mixed in ratio of 4 cement :1 hardenar (by weight) :2 stone agrgregates of 6mm and down size laid integral with base course and finished smooth including cleaning the sub-base surface, applying neat cement slurry @2.75 Kg of cement per Sq.M of area over sub-base to receive the base course, levelling, tamping, trowelling, finishing, curing, providing shuttering to the edges etc. all complete. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	1200	m²		1030	1236000
2629	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.4	Providing and laying 125mm high cement plaster skirting with 1:3 cement mortar (1 cement : 3 coarse sand by volume) finished with a floating coat of neat cement slurry @ 2.75kg. of cement per Sq.M of area including rounding of junctions with floor, preparing the wall surface, making recess in the wall, finishing, curing etc. all complete.					
2630	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.4.1	18mm thick. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	248	RM		80	19840
2631	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.6	Panel dividers in flooring/dado					
2632	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.2.6.6	P.V.C. panel dividers (3mm x 40mm size.)	2160	RM		70	151200
2633	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8	ROOFING					
2634	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.17	Providing and laying in position approved quality profiled, precoated, steel sheets (for roofing, cladding etc.) made from cold rolled high tensile Zincalume/ Galvalume Steel of 550 MPA yield stress conforming to IS:513, IS:15961 and ASTM AS: 1397; the substrate shall be hot dip metallic coating of aluminium- zinc alloy (150 grams per sq. mtr. Total on both sides, coating class AZ150); the bottom unexposed surface shall be provided with alkyd backer of minimum 5 microns over a 5 micron coat of primer; top exposed surface shall have SDP (Super Durable Polyester) paint system MINIMUM 20 microns in approved shade applied over 5 microns primer; overall coated thickness of sheets not less than 0.52 mm having base metal thickness of minimum 0.45mm (negative tolerance not acceptable), profile depth not less than 28mm and pitch of 195 to 255mm; including cutting, mitering, laps, providing cutouts for fixing accessories, necessary fastners (approved quality anti corrosive polyester polymer coated, rivets, nuts, bolts, self drilling screws/ fasteners with integral washers and EPDM seals, and nylon colour caps and natural cure type joint sealants etc.) All complete as per approved manufacturer's specifications. Note: The steel sheet shall have brand marking of coated steel manufacturer (product details, date, mfg name, etc) on back side at regular interval confirming genuinity of the material.	4280	m²		1280	5478400

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2635	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.18	Providing and laying in position roofing and cladding accessories like ridge piece, corner piece, north light curve piece, apron piece, gutter, flashing etc. fabricated out of 0.5mm precoated Zincalume/ Galvalume Steel steel sheets of same material/ quality etc. as that of sheeting; bent and profiled to match with the roofing and cladding, including all cutting, fabrication, rivetting, fastners etc. all complete.	1190	m²		1280	1523200
2636	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.20	Polycarbonate sheets roofing/ cladding Providing and fixing in position (for roofing and cladding) machine made 2mm thick corrugated polycarbonate sheets (conforming to IS :14434, 14443) of approved manufacturer (in approved shade) extruded from polycarbonate resin, having profiles as approved/ matching exactly with the surrounding pre-coated roofing/ cladding sheets and having following properties: (a) Specific gravity 1.2 g/ cm3 (b) Hardness 119 M Scale (c) Tensile Strength 64 Mpa (d) Compressive strength 66Mpa (e) Impact Strength 900 J/m The item includes fixing to steel structure members (truss/ purlins)/ brick masonry walls by means of polymer coated 'J' or 'L' hooks, bolts, nuts 8mm dia G.I. bitumen washers etc. all complete as per approved manufacturer's recommendations and specifications.	480	m²		3020	1449600
2637	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.21	Barricading of corrugated GI sheet of 0.8mm thickness Providing and fixing corrugated GI sheet of 0.8mm thickness, minimum 120 GSM coating and conforming to IS : 277 in barricading cladding, corner piece, etc. with 8mm dia `J' or `L' type anticorrosive polymer coated GI hook, bolts, nuts and polymer cap, seal and thrust washer including cutting to proper size, drilling holes, mitering, laps, finishing, providing anticorrosive protective coating on hooks, nuts, bolts etc. and maintaining the same during project execution. After completion of the retention period mentioned elsewhere in the BID document, all materials shall be dismantled and taken away by the contractor outside plant boundary to the complete satisfaction of Engineer-in-charge all complete as per the direction of Engineer-in-charge. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	10	m²		550	5500
2638	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.24	Providing and fixing industrial grade wind driven turbine ventilator/ air-extractor having rotating turbine vents made of anodized aluminium (grade H24), with teflon bearings, teflon bush, teflon cap, translucent FRP base, stainless steel shaft having zero friction rotation etc. all complete as per manufacturer¿s specifications, including fixing on pitched metallic roof sheeting with required overlapping, providing supporting framework, anticorrosive polyester coated nuts, bolts, screws, sealing of all joints so that there shall not be any accumulation or leakage of water, making them waterproof etc. all complete.					
2639	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.24.2	approx. size 457 mm outer dia. with minimum 1150 CFM capacity	24	nos		6680	160320
2640	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.MJ31	Miscellaneous					
2641	A	B957-999-81-46-PK-SOR-9501-A-0M	01AR.8.MJ31.01	Providing and fixing in position approved quality gravity type weather tight ridge ventilator with (600mm throat width) made of steel sheet (sheet thickness, specification and coating similar to external steel sheet of roof sheeting) including necessary framing, flashing, bird screen, trims, sealants, EPDM/ beadings etc. all complete in accordance with approved manufacturer's standard practice.	100	RM		3980	398000
2642	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG	GEOTECH					
2643	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300	GROUND IMPROVEMENT					
2644	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.1	SAND GRAVEL MIX					
2645	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.1.1	Supplying and filling sand gravel mix (1:1) with approved aggregate below road, RCC pavement, manholes, pits, foundations, bedding of UG piping etc. in layers of 150 mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density as per IS 2720 Part-XIV, quarrying, royalties, transportation, handling, etc. all complete as per drawings, specifications and directions of Engineer-in-Charge. (The rate shall be inclusive of the cost of all labour, material, equipment etc. all complete)	200	cum		2770	554000
2646	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.2	GEOGRID					
2647	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.2.1	Supplying and laying of Tensar Geogrid SS-40 or equivalent below roads, RCC pavements, manholes, in pipe trenches, culverts, foundations, hard stand etc. including overlap length, royalties, taxes, handling, transportation, unloading, storage, etc. all complete as per drawings, manufacturers specification and direction of Engineer-in-Charge.	150	sqm		430	64500
2648	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.MF2	ROCK ANCHORS					
2649	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.MF2.1	Installation of Rock Anchor including Supply, fabrication of HYSD steel bar reinforcement of 25mm of grade Fe500D conforming to IS:1786, transporting the steel, straightening, cleaning, cutting, overlapping, welding, bending to required Shapes and length etc., drilling hole of 100mm nominal dia. upto a maximum length of 2m, mobilization of drilling equipment, compressor and other necessary plant and equipment, placing reinforcement with spacer/ centralizers upto specified depth, grouting of holes with cement grout Minimum Strength of 40 N/mm2, all complete as per drawing, specification and instruction of Engineer in charge. All material are in contractor's scope of supply.	100	m		4480	448000
2650	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.MF2.2	Conducting Verification Pullout load test on Rock Anchor up to 2 times the design load (13.5 Ton) including supply & erection of testing equipment, supervision, labour etc. all complete as per specifications and directions of Engineer-in-Charge, analysing the results, making the report and submitting the same in 5 copies.	3	each		99570	298710
2651	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.MF2.3	Conducting Proof load test on Rock Anchor up to 1.5 times the design load (13.5 Ton) including supply & erection of testing equipment, supervision, labour etc. all complete as per specifications and directions of Engineer-in-Charge, analyzing the results, making the report and submitting the same in 5 copies.	4	each		99570	398280
2652	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.4	Boulder Soling					
2653	A	B957-999-81-47-PK-SOR-9501-A-0M	01GG.300.4.1	Supplying and laying of random rubble soling below hardstand, road, RCC pavement, foundation etc. in layers of 200 mm loose thickness (maximum) with nominal size of stones 100 mm to 250 mm, filling of voids with small size stones and sand, including watering, ramming, rolling, compacting, quarrying, royalties, transportation, handling etc. all complete as per specifications, drawing and directions of the Engineer-in-charge. (The rate shall be inclusive of cost of all labour, material,equipment etc., all complete).	50	cum		2840	142000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2654	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP	PROJECTS					
2655	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999	Providing pre-commissioning/commissioning assistance to the Owner/EIL by providing Skilled /Semiskilled/unskilled workers as per the direction of Engineer in - Charge with tools tackles, PPEs, consumables and Supervision (including site supervision, safety supervision) with the single point responsibility for quality, safety and speed of execution (one Man day =8 hours shift) with 1 vehicle standby for emergency at site with the following manpower on fix basis. Contractor to provide & mobilise man power in shifts on Need Basis on the instructions of Engineer -in-chrge. Note that the manpower deployment shall be inclusive of required tools and tackles and machinery such as welding machines, grinding machines, gas cutting sets , Mechanical/Electrical tool box, etc.					
2656	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000	Skilled manpower					
2657	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.100	Piping Welder (Arc & TIG)	260	Mandays		1480	384800
2658	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.200	Mill Wright fitter/ Rotary mechanic	300	Mandays		1480	444000
2659	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.300	Instrument Technician	200	Mandays		1480	296000
2660	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.400	Electrician	100	Mandays		1480	148000
2661	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.500	Valve Mechanic	180	Mandays		1480	266400
2662	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.10000.600	Rotary mechanic capable of executing maintenance work	260	Mandays		1480	384800
2663	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.11000	DEWATERING : Pumping out rain water from specific location towards downstream side by deploying suitable capacity / adequate numbers of mud pumps / submersible pumps from various types drains / culverts sump pits / unit areas discharge into the outlet point laying and connecting of discharge delivery pipe mentioned in the same contract as directed by Engineer-In-charge at site including supply of all pumps, power/diesel , connecting pipes / hoses, all enabling works, tools and tackles etc. completely in all respect as per the directions of the Engineer-In-charge. (Jointly accepted log book to be maintained for payment)					
2664	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.11000.100	10 HP PUMP (POWER/DIESEL operated)	10	Hour		1320	13200
2665	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.11000.200	5 HP PUMP (POWER/DIESEL operated)	10	Hour		1010	10100
2666	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.11000.300	2 HP PUMP (POWER/DIESEL operated)	10	Hour		610	6100
2667	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.12000	Contractor to provide & mobilise following man power on the instructions of Engineer in- charge. However, 2 weeks' notice shall be given for mobilisation and 1 day notice Shall be given for demobilisation. Note that quoted rate of manpower deployment shall be inclusive of required PPEs and facilities required for functioning at site. (1 Man-Month should be considered as 30 man-days.					
2668	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.12000.100	Safety supervisor	18	Man month		78120	1406160
2669	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.12000.200	Safety Officer/Engineer	18	Man month		97650	1757700
2670	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000	Semi-skilled Manpower					
2671	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.100	Piping/structural fitter	800	Mandays		1140	912000
2672	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.200	Structural welder	700	Mandays		1140	798000
2673	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.300	Gas cutter	800	Mandays		1140	912000
2674	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.400	Grinder/driller	800	Mandays		1140	912000
2675	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.500	Rigger	800	Mandays		1140	912000
2676	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.20000.600	Concrete chipper	300	Mandays		1140	342000
2677	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.30000	Unskilled manpower					
2678	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.30000.100	Helper/Assistants	3900	Mandays		850	3315000
2679	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.40000	Commissioning operator (Qualification degree with 3 yrs. of experience or diploma with 5 years' experience) --	600	Mandays		3200	1920000
2680	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.50000	Commissioning supervisor (B.E. with 5 years' experience of commissioning activities in refineries, petrochemical etc) (1 man month= 26 days @ 8 hours per day duty)	16	Man month		90000	1440000
2681	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.60000	Supervisor/ Foreman	16	Mandays		1900	30400
2682	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.70000	Fork lift operator (1 man month= 26 days @ 8 hours per day duty)	3	Man month		43680	131040
2683	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.70001	Supply of Flame proof torches- rechargeable (with high intensity)	10	nos		8500	85000
2684	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.70002	Supply of 40/80 wire-mesh SS for covering strainers/filters	50	nos		2580	129000
2685	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.70003	Supply of rubber hoses(1", 15 mtr length, pressure-500 psi)	20	nos		7730	154600
2686	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.70004	Supply of fire hoses with connector for fire hydrants (dia. 63 mm, length-15 mtr as per relevant international specifications)	20	nos		7210	144200
2687	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.80000	Providing Hydraulic mobile Crane (min. 15 Ton capacity wheel mounted) including fuel, lube and operator & helper charges, sling web belts d-shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipe-spools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		8850	265500
2688	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.90000	Providing trailer including fuel, lube and operator & khalasi charges for transportation of material (including pipes, structural steel, fittings, valves, gaskets, earth, wooden scrap, usable material, metallic or non-metallic scrap) from & to project/unit area, stores, warehouse, dump yard/scrap yard as directed. (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASED FOR COMMISSIONING	30	day		7500	225000
2689	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.98000	Providing "Telescopic/Lattice" type crane (100 Ton capacity wheel mounted/CRAWLER) including fuel, lube and operator & helper charges, sling web belts d- shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipe-spools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		50000	1500000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2690	A	B957-999-85-41-PK-SOR-9501-A-2M	01QP.999.99000	Providing "Telescopic" type crane (40 Ton capacity wheel mounted) including fuel, lube and operator & helper charges, sling web belts d- shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipespools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day=8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		25000	750000
		SUB TOTAL							4245229519.00
2691	B	B957-999-06-45-PK-SOR-9501-B-0M	01CT	CATHODIC PROTECTION					
2692	B	B957-999-06-45-PK-SOR-9501-B-0M	01CT.ME0	Cathodic Protection System for Plant:					
2693	B	B957-999-06-45-PK-SOR-9501-B-0M	01CT.ME0.1	Survey, Design, Detail Engineering, Supply, installation, testing, commissioning, etc of the cathodic protection system for the buried facilities. All work shall be carried out conforming to the scope of work, design basis, data sheets, specifications, standards, drawings, etc as per the provisions of GCC, SCC and specification no: B957-999-06-45-CSP-9501, Rev. 0.	1	Lumpsum		10768370	10768370
2694	B	B957-999-16-43-PK-SOR-9501-B-3M	M20000000000	PIPING-OFFSITES					
2695	B	B957-999-16-43-PK-SOR-9501-B-3M	M20900000000	PIPING (ABOVE GROUND) :-Transportation of all piping items from Owners storage point to work site/work shop; fabrication including cutting, edge preparation, (inclusive of grinding the edges of pipe, pipe spools, fittings, flanges etc. to match with the mating edges of uneven/different thickness wherever required); fitup, bending, preheating wherever required, welding, threading, and laying of pipes and pipe spools (spools along with supports) of all types and thickness over sleepers, overhead on racks and at all elevations, hook-ups with existing piping, connecting with equipment nozzles, strainers, steam traps, static mixers, sight flow indicators, thermal sleeve, orifice assemblies, spray nozzles, rotameters, tappings for pressure gauges, thermowells, sample connections, sample coolers, closed sample system cabinets etc. and fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fittings, like elbows, reducers, tees, flanges, spectacle blinds and spacer and blinds, piping specials such as mitres and fabricated fittings, vents, drains (but excluding reinforcing pads), SW valves upto 1.5 NB, Steam Supply/ Condensate Recovery stations(Cast/Fabricated), Supply and welding of Strip as per EIL Std 7-51-0112 to all pipes before hydro-testing at exit points of Units for earthing purpose; alignment, cleaning and flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified draining, drying by compressed air, performing Positive Material Identification(PMI) using alloy analysers, completing all such works in all respects (including preparation of isometrics as mentioned in the Scope of Work for the job) as per the specifications, drawings and instructions of Engineer-in-Charge. PMI shall be performed by third party as defined in PMI spec.Rates for tubing (if any) shall include rates for valves, fittings, all in line instruments and testing etc. Carbon steel piping includes LTCS piping also. Erection of all inline instruments like flow instruments and specialty items like static mixers, sample coolers, thermal sleeve, air mixers, exhaust head, rupture disk, flow meters, venturi tube, flame arrestor, thermal flow switch etc. except valve shall be considered as part of piping and separate payment shall not be made on this account. Note : Contractor to refer to Instrumentation SOR for specific details and rates of Instrumentation items not covered herein.					
2696	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901000000	CARBON STEEL PIPING (NON IBR); THK. <= 10MM					
2697	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901010000	FABRICATION (BUTT WELD- MANUAL)					
2698	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901019100	NB UPTO 1.5 INCH	475	Inch Dia		800	380000
2699	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901019200	NB 2 INCH - 6 INCH	63110	Inch Dia		800	50488000
2700	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901019300	NB 8 INCH - 14 INCH	32830	Inch Dia		800	26264000
2701	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901019400	NB 16 INCH - 24 INCH	17135	Inch Dia		800	13708000
2702	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901019500	NB 26 INCH - 36 INCH	5460	Inch Dia		800	4368000
2703	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901020000	FABRICATION (FILLET WELD)					
2704	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901029100	NB UPTO 1.5 INCH	4405	Inch Dia		670	2951350
2705	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901029200	NB 2 INCH - 6 INCH	295	Inch Dia		670	197650
2706	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901029300	NB 8 INCH - 14 INCH	335	Inch Dia		670	224450
2707	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901029400	NB 16 INCH - 24 INCH	25	Inch Dia		670	16750
2708	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2709	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901039300	NB 8 INCH - 14 INCH	14070	Inch Dia		960	13507200
2710	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901039400	NB 16 INCH - 24 INCH	7345	Inch Dia		960	7051200
2711	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901039500	NB 26 INCH - 36 INCH	2340	Inch Dia		960	2246400
2712	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901040000	ERECTION (OTHER THAN SPOOL)					
2713	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049100	NB UPTO 1.5 INCH	2840	Inch M		290	823600
2714	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049200	NB 2 INCH - 6 INCH	302950	Inch M		290	87855500
2715	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049300	NB 8 INCH - 14 INCH	255250	Inch M		290	74022500
2716	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049400	NB 16 INCH - 24 INCH	114210	Inch M		290	33120900
2717	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049500	NB 26 INCH - 36 INCH	47815	Inch M		300	14344500
2718	B	B957-999-16-43-PK-SOR-9501-B-3M	M20901049600	NB 38 INCH - 48 INCH	10	Inch M		300	3000
2719	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902000000	CARBON STEEL PIPING (NON IBR); THK. > 10MM AND <= 20MM					
2720	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902010000	FABRICATION (BUTT WELD- MANUAL)					
2721	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902019200	NB 2 INCH - 6 INCH	1915	Inch Dia		940	1800100
2722	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902019300	NB 8 INCH - 14 INCH	11220	Inch Dia		940	10546800

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2723	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902019500	NB 26 INCH - 36 INCH	90	Inch Dia		940	84600
2724	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902019600	NB 38 INCH - 48 INCH	13185	Inch Dia		940	12393900
2725	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902019700	NB 50 INCH - 60 INCH	3175	Inch Dia		940	2984500
2726	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2727	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902039300	NB 8 INCH - 14 INCH	4810	Inch Dia		1140	5483400
2728	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902039500	NB 26 INCH - 36 INCH	40	Inch Dia		1140	45600
2729	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902039600	NB 38 INCH - 48 INCH	5650	Inch Dia		1140	6441000
2730	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902039700	NB 50 INCH - 60 INCH	1360	Inch Dia		1140	1550400
2731	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902040000	ERECTION (OTHER THAN SPOOL)					
2732	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902049200	NB 2 INCH - 6 INCH	8505	Inch M		300	2551500
2733	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902049300	NB 8 INCH - 14 INCH	78730	Inch M		300	23619000
2734	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902049500	NB 26 INCH - 36 INCH	580	Inch M		300	174000
2735	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902049600	NB 38 INCH - 48 INCH	119595	Inch M		330	39466350
2736	B	B957-999-16-43-PK-SOR-9501-B-3M	M20902049700	NB 50 INCH - 60 INCH	34035	Inch M		330	11231550
2737	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906000000	CARBON STEEL PIPING (IBR); THK. <= TO 10MM					
2738	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906010000	FABRICATION (BUTT WELD- MANUAL)					
2739	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906019100	NB UPTO 1.5 INCH	20	Inch Dia		870	17400
2740	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906019200	NB 2 INCH - 6 INCH	2480	Inch Dia		870	2157600
2741	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906019300	NB 8 INCH - 14 INCH	9100	Inch Dia		870	7917000
2742	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906019400	NB 16 INCH - 24 INCH	1570	Inch Dia		870	1365900
2743	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906020000	FABRICATION (FILLET WELD)					
2744	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906029100	NB UPTO 1.5 INCH	360	Inch Dia		770	277200
2745	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2746	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906039300	NB 8 INCH - 14 INCH	3900	Inch Dia		1040	4056000
2747	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906039400	NB 16 INCH - 24 INCH	675	Inch Dia		1040	702000
2748	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906040000	ERECTION (OTHER THAN SPOOL)					
2749	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906049100	NB UPTO 1.5 INCH	170	Inch M		290	49300
2750	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906049200	NB 2 INCH - 6 INCH	8400	Inch M		290	2436000
2751	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906049300	NB 8 INCH - 14 INCH	56910	Inch M		290	16503900
2752	B	B957-999-16-43-PK-SOR-9501-B-3M	M20906049400	NB 16 INCH - 24 INCH	10320	Inch M		290	2992800
2753	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907000000	CARBON STEEL PIPING (IBR); THK. > 10MM AND <= 20MM					
2754	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907010000	FABRICATION (BUTT WELD- MANUAL)					
2755	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907019200	NB 2 INCH - 6 INCH	390	Inch Dia		1020	397800
2756	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907019300	NB 8 INCH - 14 INCH	645	Inch Dia		1020	657900
2757	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907019400	NB 16 INCH - 24 INCH	1370	Inch Dia		1020	1397400
2758	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2759	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907039300	NB 8 INCH - 14 INCH	280	Inch Dia		1220	341600
2760	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907039400	NB 16 INCH - 24 INCH	590	Inch Dia		1220	719800
2761	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907040000	ERECTION (OTHER THAN SPOOL)					
2762	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907049200	NB 2 INCH - 6 INCH	2070	Inch M		300	621000
2763	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907049300	NB 8 INCH - 14 INCH	4165	Inch M		300	1249500
2764	B	B957-999-16-43-PK-SOR-9501-B-3M	M20907049400	NB 16 INCH - 24 INCH	8715	Inch M		300	2614500
2765	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911000000	STAINLESS STEEL PIPING (NON-IBR); THK. <= 10MM					
2766	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911010000	FABRICATION (BUTT WELD- MANUAL)					
2767	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911019100	NB UPTO 1.5 INCH	35	Inch Dia		1570	54950
2768	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911019200	NB 2 INCH - 6 INCH	4035	Inch Dia		1570	6334950
2769	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911019300	NB 8 INCH - 14 INCH	950	Inch Dia		1570	1491500
2770	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911019400	NB 16 INCH - 24 INCH	30	Inch Dia		1570	47100
2771	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911019500	NB 26 INCH - 36 INCH	950	Inch Dia		1570	1491500
2772	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911020000	FABRICATION (FILLET WELD)					
2773	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911029100	NB UPTO 1.5 INCH	235	Inch Dia		1270	298450
2774	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2775	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911039300	NB 8 INCH - 14 INCH	410	Inch Dia		1890	774900
2776	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911039400	NB 16 INCH - 24 INCH	15	Inch Dia		1890	28350
2777	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911039500	NB 26 INCH - 36 INCH	410	Inch Dia		1890	774900

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2778	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911040000	ERECTION (OTHER THAN SPOOL)					
2779	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911049100	NB UPTO 1.5 INCH	100	Inch M		370	37000
2780	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911049200	NB 2 INCH - 6 INCH	21130	Inch M		370	7818100
2781	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911049300	NB 8 INCH - 14 INCH	7415	Inch M		370	2743550
2782	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911049400	NB 16 INCH - 24 INCH	115	Inch M		370	42550
2783	B	B957-999-16-43-PK-SOR-9501-B-3M	M20911049500	NB 26 INCH - 36 INCH	4950	Inch M		370	1831500
2784	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912000000	STAINLESS STEEL PIPING (NON-IBR); THK. > 10MM AND <= 20MM					
2785	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912010000	FABRICATION (BUTT WELD- MANUAL)					
2786	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912019300	NB 8 INCH - 14 INCH	185	Inch Dia		1980	366300
2787	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2788	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912039300	NB 8 INCH - 14 INCH	80	Inch Dia		2580	206400
2789	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912040000	ERECTION (OTHER THAN SPOOL)					
2790	B	B957-999-16-43-PK-SOR-9501-B-3M	M20912049300	NB 8 INCH - 14 INCH	330	Inch M		430	141900
2791	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918000000	STAINLESS STEEL PIPING (IBR); THK. <= 10MM					
2792	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918010000	FABRICATION (BUTT WELD- MANUAL)					
2793	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918019200	NB 2 INCH - 6 INCH	895	Inch Dia		1690	1512550
2794	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918019300	NB 8 INCH - 14 INCH	35	Inch Dia		1690	59150
2795	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918020000	FABRICATION (FILLET WELD)					
2796	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918029100	NB UPTO 1.5 INCH	10	Inch Dia		1540	15400
2797	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2798	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918039300	NB 8 INCH - 14 INCH	15	Inch Dia		2040	30600
2799	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918040000	ERECTION (OTHER THAN SPOOL)					
2800	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918049100	NB UPTO 1.5 INCH	5	Inch M		370	1850
2801	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918049200	NB 2 INCH - 6 INCH	4645	Inch M		370	1718650
2802	B	B957-999-16-43-PK-SOR-9501-B-3M	M20918049300	NB 8 INCH - 14 INCH	30	Inch M		370	11100
2803	B	B957-999-16-43-PK-SOR-9501-B-3M	M20944000000	STEAM TRACERS CARBON STEEL					
2804	B	B957-999-16-43-PK-SOR-9501-B-3M	M20944000400	NB 0.500 INCHES	15	Metres		910	13650
2805	B	B957-999-16-43-PK-SOR-9501-B-3M	M20944000600	NB 1.000 INCHES	15	Metres		910	13650
2806	B	B957-999-16-43-PK-SOR-9501-B-3M	M20944000800	NB 1.500 INCHES	15	Metres		1360	20400
2807	B	B957-999-16-43-PK-SOR-9501-B-3M	M20991000000	ALLOY STEEL P91 PIPING (IBR); THK. <= 10MM					
2808	B	B957-999-16-43-PK-SOR-9501-B-3M	M20991040000	ERECTION (OTHER THAN SPOOL)					
2809	B	B957-999-16-43-PK-SOR-9501-B-3M	M20991049300	NB 8 INCH - 14 INCH	25	Inch M		330	8250
2810	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993000000	ALLOY STEEL P91 PIPING (IBR); THK. > 20MM AND <= 30MM					
2811	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993010000	FABRICATION (BUTT WELD- MANUAL)					
2812	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993019300	NB 8 INCH - 14 INCH	260	Inch Dia		2510	652600
2813	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2814	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993039300	NB 8 INCH - 14 INCH	110	Inch Dia		2740	301400
2815	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993040000	ERECTION (OTHER THAN SPOOL)					
2816	B	B957-999-16-43-PK-SOR-9501-B-3M	M20993049300	NB 8 INCH - 14 INCH	150	Inch M		430	64500
2817	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994000000	ALLOY STEEL P91 PIPING (IBR); THK. > 30MM AND <= 40MM					
2818	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994010000	FABRICATION (BUTT WELD- MANUAL)					
2819	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994019400	NB 16 INCH - 24 INCH	5090	Inch Dia		3270	16644300
2820	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994030000	FABRICATION (BUTT WELD-AUTOMATIC/MECHANIZED/ROBOTIC/ORBITAL)					
2821	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994039400	NB 16 INCH - 24 INCH	2180	Inch Dia		3560	7760800
2822	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994050000	ERECTION (SPOOL)					
2823	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994059300	NB 8 INCH - 14 INCH	230	Inch M		430	98900
2824	B	B957-999-16-43-PK-SOR-9501-B-3M	M20994059400	NB 16 INCH - 24 INCH	23460	Inch M		430	10087800
2825	B	B957-999-16-43-PK-SOR-9501-B-3M	M21600000000	VALVES :- Transportation of all types of valves (Including special valves and motor operated valves) from Owners storage points to contractors stores/worksite and installation of valves for all rating including assembly of valves accessories like air bottles etc, if any, fixing of gaskets bolts/nuts wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge. Note : For PRDS, PSVs, TSVs, Control valves, On-Off/Shutdown valves and Self actuating valves all details and rates shall be as per Instrumentation SOR.					
2826	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601000000	FLANGED/WAFER VALVES INCLUDING MOV (UPTO 600#)					
2827	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601000400	NB 0.500 INCHES	4	Nos		630	2520
2828	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601000500	NB 0.750 INCHES	159	Nos		630	100170
2829	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601000600	NB 1.000 INCHES	114	Nos		630	71820

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2830	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601000900	NB 2.000 INCHES	277	Nos		990	274230
2831	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001100	NB 3.000 INCHES	127	Nos		1480	187960
2832	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001300	NB 4.000 INCHES	126	Nos		1970	248220
2833	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001500	NB 6.000 INCHES	208	Nos		2960	615680
2834	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001600	NB 8.000 INCHES	117	Nos		3940	460980
2835	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001700	NB 10.000 INCHES	25	Nos		4930	123250
2836	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001800	NB 12.000 INCHES	43	Nos		5910	254130
2837	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601001900	NB 14.000 INCHES	1	Nos		6900	6900
2838	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601002000	NB 16.000 INCHES	1	Nos		7880	7880
2839	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601002100	NB 18.000 INCHES	5	Nos		8870	44350
2840	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601002500	NB 26.000 INCHES	1	Nos		12810	12810
2841	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601002700	NB 30.000 INCHES	1	Nos		18960	18960
2842	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601002800	NB 32.000 INCHES	1	Nos		20220	20220
2843	B	B957-999-16-43-PK-SOR-9501-B-3M	M21601003000	NB 36.000 INCHES	1	Nos		22750	22750
2844	B	B957-999-16-43-PK-SOR-9501-B-3M	M21606000000	CARBON STEEL BW VALVES INCLUDING MOV (IBR)					
2845	B	B957-999-16-43-PK-SOR-9501-B-3M	M21606001300	NB 4.000 INCHES	3	Nos		4030	12090
2846	B	B957-999-16-43-PK-SOR-9501-B-3M	M21606001900	NB 14.000 INCHES	3	Nos		14100	42300
2847	B	B957-999-16-43-PK-SOR-9501-B-3M	M21606002000	NB 16.000 INCHES	3	Nos		16110	48330
2848	B	B957-999-16-43-PK-SOR-9501-B-3M	M21900000000	SPRING SUPPORT ASSEMBLIES :- Transportation of all types of spring support assemblies from Owner's storage points to contractor's stores/worksite and installation of spring support assemblies for all rating including assembly, if any, fixing of gaskets bolts/nuts, welding attachments wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge. Contractor to ensure that travel stops are removed and spring is locked in cold load position for Hydrotest. It shall be ensured that locking devices are removed and springs are properly set at hot load position during commissioning.					
2849	B	B957-999-16-43-PK-SOR-9501-B-3M	M21901000000		4	MT		74980	299920
2850	B	B957-999-16-43-PK-SOR-9501-B-3M	M22000000000	BOLT TENSIONING :- Carrying out tensioning of bolted joints on all types of piping as called for in EIL Specification No.6-76-0002 on already erected system including supply of all materials, recording devices, instruments etc; Providing all normal and special equipment and gadgets, skilled / un skilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of engineer-in-charge. some joints may require bolt tensioning more than once, but, payment for one joint shall be made only once.					
2851	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001000000	150# JOINTS					
2852	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001001900	NB 14.000 INCHES	9	Nos		4800	43200
2853	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001002000	NB 16.000 INCHES	1	Nos		5480	5480
2854	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001002100	NB 18.000 INCHES	26	Nos		6170	160420
2855	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001002200	NB 20.000 INCHES	31	Nos		6860	212660
2856	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001002400	NB 24.000 INCHES	16	Nos		8230	131680
2857	B	B957-999-16-43-PK-SOR-9501-B-3M	M22001003100	NB 38.000 INCHES	5	Nos		18720	93600
2858	B	B957-999-16-43-PK-SOR-9501-B-3M	M22002000000	300# JOINTS					
2859	B	B957-999-16-43-PK-SOR-9501-B-3M	M22002001700	NB 10.000 INCHES	18	Nos		4930	88740
2860	B	B957-999-16-43-PK-SOR-9501-B-3M	M22002001800	NB 12.000 INCHES	103	Nos		5910	608730
2861	B	B957-999-16-43-PK-SOR-9501-B-3M	M22002001900	NB 14.000 INCHES	29	Nos		6900	200100
2862	B	B957-999-16-43-PK-SOR-9501-B-3M	M22002002500	NB 26.000 INCHES	3	Nos		12810	38430
2863	B	B957-999-16-43-PK-SOR-9501-B-3M	M22004000000	600# JOINTS					
2864	B	B957-999-16-43-PK-SOR-9501-B-3M	M22004001500	NB 6.000 INCHES	69	Nos		3790	261510
2865	B	B957-999-16-43-PK-SOR-9501-B-3M	M22004001600	NB 8.000 INCHES	100	Nos		5060	506000
2866	B	B957-999-16-43-PK-SOR-9501-B-3M	M22004001700	NB 10.000 INCHES	8	Nos		6320	50560
2867	B	B957-999-16-43-PK-SOR-9501-B-3M	M22004001800	NB 12.000 INCHES	33	Nos		7580	250140
2868	B	B957-999-16-43-PK-SOR-9501-B-3M	M22006000000	1500# JOINTS					
2869	B	B957-999-16-43-PK-SOR-9501-B-3M	M22006000900	NB 2.000 INCHES	5	Nos		1890	9450
2870	B	B957-999-16-43-PK-SOR-9501-B-3M	M22006001300	NB 4.000 INCHES	14	Nos		3770	52780
2871	B	B957-999-16-43-PK-SOR-9501-B-3M	M22006001500	NB 6.000 INCHES	10	Nos		5660	56600
2872	B	B957-999-16-43-PK-SOR-9501-B-3M	M22006001800	NB 12.000 INCHES	68	Nos		11310	769080
2873	B	B957-999-16-43-PK-SOR-9501-B-3M	M22100000000	REINFORCING PADS FOR PIPES :- Fabrication of reinforcing pads for pipe connection wherever required (from pipes only supplied by the Owner) and erection, fitup, welding and testing (including DP/MP) if required of the same and performing Positive Material Identification(PMI) using alloy analysers as per the specifications, drawings and instructions of the Engineer-in-Charge. Note: Sizes mentioned for Reinforcing Pads are for branch pipe					
2874	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101000000	C.S REINFORCING PADS					
2875	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101000900	NB 2.000 INCHES	27	Nos		2740	73980

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2876	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001100	NB 3.000 INCHES	8	Nos		4110	32880
2877	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001300	NB 4.000 INCHES	7	Nos		5480	38360
2878	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001500	NB 6.000 INCHES	48	Nos		8230	395040
2879	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001600	NB 8.000 INCHES	21	Nos		10970	230370
2880	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001700	NB 10.000 INCHES	4	Nos		13710	54840
2881	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101001800	NB 12.000 INCHES	1	Nos		16450	16450
2882	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101002000	NB 16.000 INCHES	4	Nos		21940	87760
2883	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101002100	NB 18.000 INCHES	9	Nos		24680	222120
2884	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101002400	NB 24.000 INCHES	16	Nos		37020	592320
2885	B	B957-999-16-43-PK-SOR-9501-B-3M	M22101002800	NB 32.000 INCHES	3	Nos		49360	148080
2886	B	B957-999-16-43-PK-SOR-9501-B-3M	M22103000000	S.S REINFORCING PADS					
2887	B	B957-999-16-43-PK-SOR-9501-B-3M	M22103000900	NB 2.000 INCHES	1	Nos		4860	4860
2888	B	B957-999-16-43-PK-SOR-9501-B-3M	M22103001300	NB 4.000 INCHES	1	Nos		9730	9730
2889	B	B957-999-16-43-PK-SOR-9501-B-3M	M22103001500	NB 6.000 INCHES	1	Nos		14590	14590
2890	B	B957-999-16-43-PK-SOR-9501-B-3M	M22103001900	NB 14.000 INCHES	1	Nos		34040	34040
2891	B	B957-999-16-43-PK-SOR-9501-B-3M	M22200000000	RADIOGRAPHY :- Performance of radiographic inspection on piping of all types and thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge. Radiographs shall be submitted to the Engineer-in-charge. (Repeat Radiography due to defective radiograph on repaired joints due to Contractors fault and for additional radiography necessitated due to poor performance of contractors welders shall be done at contractors cost) Note: Unit for radiography quantity is Nos of circumferencial weld joints.					
2892	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201000000	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
2893	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201000500	NB 0.750 INCHES	20	Nos		490	9800
2894	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201000600	NB 1.000 INCHES	7	Nos		490	3430
2895	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201000800	NB 1.500 INCHES	1	Nos		510	510
2896	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201000900	NB 2.000 INCHES	157	Nos		690	108330
2897	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201001100	NB 3.000 INCHES	230	Nos		1030	236900
2898	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201001300	NB 4.000 INCHES	458	Nos		1370	627460
2899	B	B957-999-16-43-PK-SOR-9501-B-3M	M22201001500	NB 6.000 INCHES	291	Nos		2060	599460
2900	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202000000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
2901	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202000500	NB 0.750 INCHES	13	Nos		490	6370
2902	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202000800	NB 1.500 INCHES	4	Nos		510	2040
2903	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202000900	NB 2.000 INCHES	113	Nos		690	77970
2904	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001100	NB 3.000 INCHES	420	Nos		1030	432600
2905	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001300	NB 4.000 INCHES	13	Nos		1370	17810
2906	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001500	NB 6.000 INCHES	350	Nos		2060	721000
2907	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001600	NB 8.000 INCHES	5	Nos		2740	13700
2908	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001700	NB 10.000 INCHES	7	Nos		3430	24010
2909	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202001900	NB 14.000 INCHES	8	Nos		4800	38400
2910	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202002200	NB 20.000 INCHES	3	Nos		6860	20580
2911	B	B957-999-16-43-PK-SOR-9501-B-3M	M22202002600	NB 28.000 INCHES	53	Nos		9600	508800
2912	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203000000	FOR JOINTS ABOVE THK. 8MM					
2913	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001300	NB 4.000 INCHES	147	Nos		1370	201390
2914	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001500	NB 6.000 INCHES	18	Nos		2060	37080
2915	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001600	NB 8.000 INCHES	458	Nos		2740	1254920
2916	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001700	NB 10.000 INCHES	98	Nos		3430	336140
2917	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001800	NB 12.000 INCHES	130	Nos		4110	534300
2918	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203001900	NB 14.000 INCHES	26	Nos		4800	124800
2919	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203002000	NB 16.000 INCHES	38	Nos		5480	208240
2920	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203002100	NB 18.000 INCHES	26	Nos		6170	160420
2921	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203002200	NB 20.000 INCHES	1	Nos		6860	6860
2922	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203002400	NB 24.000 INCHES	446	Nos		8230	3670580
2923	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203002600	NB 28.000 INCHES	3	Nos		9600	28800
2924	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203003100	NB 38.000 INCHES	3	Nos		13030	39090
2925	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203003600	NB 48.000 INCHES	13	Nos		16450	213850
2926	B	B957-999-16-43-PK-SOR-9501-B-3M	M22203004000	NB 56.000 INCHES	5	Nos		19200	96000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2927	B	B957-999-16-43-PK-SOR-9501-B-3M	M22300000000	DYE PENETRATION/MAGNETIC PARTICLE TEST :- Performance of magnetic particle/ dye penetrant test including supply of all necessary materials, equipment and labour for carrying out the work as per specification and directions of Engineer-in-Charge.					
2928	B	B957-999-16-43-PK-SOR-9501-B-3M	M22301000000	DYE PENETRANT TEST	7781	Inches		90	700290
2929	B	B957-999-16-43-PK-SOR-9501-B-3M	M22302000000	MAGNETIC PARTICLE TEST	1040	Inches		130	135200
2930	B	B957-999-16-43-PK-SOR-9501-B-3M	M22400000000	PIPE SUPPORTS (FROM MATERIALS SUPPLIED BY OWNER) :- Fabrication, erection(at all elevations) of pipe supports like shoes, cradles, hangers, clamps(of all sizes/thicknesses manufactured by forming method using die), turn buckles, saddles, guides, special supports, pads(including corrosion pads & protection shields), providing and welding of stiffeners as per drawings, T post etc. of all types including supply and application one coat of primer, all necessary equipments, consumables, labour, returning surplus materials and scrap etc to owners storage points and completing work as per drawings, specifications and instructions of Engineer-in-charge. Modifications/rectifications, if required; and adjustment/ alignment during precommisioning, commisioning as per the instructions of Engineer-in-charge. Fabrication of extension of spindle for valves, provision of locking arrangement, etc. shall also be considered under this item.					
2931	B	B957-999-16-43-PK-SOR-9501-B-3M	M22404000000	DUMMY PIPE SUPPORTS FOR C.S (OWNER SUPPLIED)	26	MT		73350	1907100
2932	B	B957-999-16-43-PK-SOR-9501-B-3M	M22405000000	DUMMY PIPE SUPPORTS FOR S.S (OWNER SUPPLIED)	4	MT		146690	586760
2933	B	B957-999-16-43-PK-SOR-9501-B-3M	M22406000000	DUMMY PIPE SUPPORTS FOR A.S (OWNER SUPPLIED)	5	MT		110020	550100
2934	B	B957-999-16-43-PK-SOR-9501-B-3M	M22500000000	PIPE SUPPORTS (FROM MATERIALS SUPPLIED BY CONTRACTOR) :- Fabrication, erection(at all elevations) of pipe supports like shoes, cradles, hangers, clamps(of all sizes/thicknesses manufactured by forming method using die), turn buckles, saddles, guides, special supports, pads(including corrosion pads & protection shields), providing and welding of stiffeners as per drawings, T post etc. of all types including supply and application one coat of primer, all necessary equipments, consumables, labour, and completing work as per drawings, specifications and instructions of Engineer-in-charge. Modifications/rectifications, if required; and adjustment/ alignment during precommisioning, commisioning as per the instructions of Engineer-in-charge. Fabrication of extension of spindle for valves, provision of locking arrangement, etc. shall also be considered under this item.					
2935	B	B957-999-16-43-PK-SOR-9501-B-3M	M22501000000	C.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	260	MT		136840	35578400
2936	B	B957-999-16-43-PK-SOR-9501-B-3M	M22502000000	S.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	3	MT		410510	1231530
2937	B	B957-999-16-43-PK-SOR-9501-B-3M	M22503000000	A.S STRUCTURAL STEEL (CONTRACTOR SUPPLIED)	1	MT		361240	361240
2938	B	B957-999-16-43-PK-SOR-9501-B-3M	M22600000000	HARDNESS TEST :- Carrying out hardness testing of weld joints on all types of piping as called for on shop / site fabricated already erected system including supply of all materials, instrument set., providing all normal and special equipment and gadgets, skilled / unskilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of engineer-in-charge. The joints under this head do not include Stress Relieved joints. Joints which do not meet the hardness requirement as per spec shall be stress relieved and re tested on contractors cost. No seperate payment shall be made for this. NOTE : Unit for hardness testing quantity is Nos. of Test Spots.					
2939	B	B957-999-16-43-PK-SOR-9501-B-3M	M22601000000	NUMBER OF TEST SPOTS	6123	Nos		120	734760
2940	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700000000	STRESS RELIEVING :- Carrying out stress relieving of weld joints, including all types of attachment welds (corrosion pads, protection shields, supports, etc.), as applicable, on all types of piping as called for on shop/site fabricated already erected system including supply of all materials, consumables recording devices, insulation materials, instruments etc., providing all normal and special equipment and gadgets, skilled/unskilled labour, specialist, supervisory staff and completing the work in all respects as per specifications and instructions of Engineer-in-Charge. Repeat performance due to defective stress relieving or any other account shall be on Contractors cost. Payment shall be done only after submission and approval of charts. Stress relieving shall be followed by measurement of hardness and no separate payment shall be made for this. Note: Unit for stress relieving quantity is (Nos of circumferential weld joints)					
2941	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700000400	NB 0.500 INCHES	18	Nos		430	7740
2942	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700000500	NB 0.750 INCHES	140	Nos		430	60200
2943	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700000600	NB 1.000 INCHES	192	Nos		430	82560
2944	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700000900	NB 2.000 INCHES	566	Nos		490	277340
2945	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700001100	NB 3.000 INCHES	1455	Nos		740	1076700
2946	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700001300	NB 4.000 INCHES	910	Nos		990	900900
2947	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700001500	NB 6.000 INCHES	1322	Nos		1480	1956560
2948	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700001600	NB 8.000 INCHES	2335	Nos		1970	4599950
2949	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700001800	NB 12.000 INCHES	450	Nos		2960	1332000
2950	B	B957-999-16-43-PK-SOR-9501-B-3M	M22700002400	NB 24.000 INCHES	758	Nos		5910	4479780
2951	B	B957-999-16-43-PK-SOR-9501-B-3M	M22900000000	Ultrasonic Testing (UT) :- Performance of UT inspection on piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge. UT shall be submitted to the Engineer-in-charge. (Repeat UT due to defective UT on repaired joints due to Contractor's fault and for additional UT necessitated due to poor performance of contractor's welders shall be done at contractor's cost) Note: Unit for UT quantity is 'Nos of circumferencial weld joints'.					
2952	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901000000	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
2953	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901000500	NB 0.750 INCHES	4	Nos		550	2200
2954	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901000600	NB 1.000 INCHES	1	Nos		550	550
2955	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901000800	NB 1.500 INCHES	33	Nos		820	27060
2956	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901000900	NB 2.000 INCHES	39	Nos		1090	42510

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
2957	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901001100	NB 3.000 INCHES	72	Nos		1650	118800
2958	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901001300	NB 4.000 INCHES	70	Nos		2200	154000
2959	B	B957-999-16-43-PK-SOR-9501-B-3M	M22901001500	NB 6.000 INCHES	70	Nos		3290	230300
2960	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902000000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
2961	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902000500	NB 0.750 INCHES	1	Nos		630	630
2962	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902000800	NB 1.500 INCHES	1	Nos		950	950
2963	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902000900	NB 2.000 INCHES	82	Nos		1260	103320
2964	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001100	NB 3.000 INCHES	21	Nos		1910	40110
2965	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001300	NB 4.000 INCHES	3	Nos		2530	7590
2966	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001500	NB 6.000 INCHES	87	Nos		3800	330600
2967	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001600	NB 8.000 INCHES	1	Nos		5060	5060
2968	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001700	NB 10.000 INCHES	1	Nos		6320	6320
2969	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902001900	NB 14.000 INCHES	13	Nos		8850	115050
2970	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902002200	NB 20.000 INCHES	1	Nos		11140	11140
2971	B	B957-999-16-43-PK-SOR-9501-B-3M	M22902002600	NB 28.000 INCHES	13	Nos		15600	202800
2972	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903000000	FOR JOINTS ABOVE THK. 8MM					
2973	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001300	NB 4.000 INCHES	36	Nos		2830	101880
2974	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001500	NB 6.000 INCHES	4	Nos		4240	16960
2975	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001600	NB 8.000 INCHES	113	Nos		5660	639580
2976	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001700	NB 10.000 INCHES	25	Nos		7070	176750
2977	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001800	NB 12.000 INCHES	22	Nos		8480	186560
2978	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903001900	NB 14.000 INCHES	7	Nos		9910	69370
2979	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903002000	NB 16.000 INCHES	9	Nos		11320	101880
2980	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903002100	NB 18.000 INCHES	7	Nos		12740	89180
2981	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903002400	NB 24.000 INCHES	1	Nos		16980	16980
2982	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903003100	NB 38.000 INCHES	1	Nos		26870	26870
2983	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903003600	NB 48.000 INCHES	1	Nos		33940	33940
2984	B	B957-999-16-43-PK-SOR-9501-B-3M	M22903004000	NB 56.000 INCHES	1	Nos		39590	39590
2985	B	B957-999-16-43-PK-SOR-9501-B-3M	M23000000000	CHEMICAL CLEANING/PICKLING :- Cleaning and pickling of equipment/pipeline includng preparation of circulation loop, supply of temporary piping, pumps, heater coils, gaskets, thermometer, hydrometer, valve, test coupon, spares, laboratory facilities, with all accessories for conducting test, chemicals, safety accessories and also providing or hiring all necessary equipment and whatever else even though not expressly mentioned herein and in specificaions but required to perform the work as per specifications and instructions of Engineer-in-Charge.					
2986	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003000000	PASSIVATION OF COOLING WATER LINES					
2987	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003000500	NB 0.750 INCHES	30	Metres		270	8100
2988	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003000800	NB 1.500 INCHES	1335	Metres		270	360450
2989	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003000900	NB 2.000 INCHES	2365	Metres		540	1277100
2990	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001100	NB 3.000 INCHES	1030	Metres		800	824000
2991	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001300	NB 4.000 INCHES	970	Metres		1070	1037900
2992	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001500	NB 6.000 INCHES	2465	Metres		1610	3968650
2993	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001600	NB 8.000 INCHES	520	Metres		2140	1112800
2994	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001700	NB 10.000 INCHES	80	Metres		2680	214400
2995	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001800	NB 12.000 INCHES	2725	Metres		3210	8747250
2996	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003001900	NB 14.000 INCHES	130	Metres		3750	487500
2997	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002000	NB 16.000 INCHES	5300	Metres		4280	22684000
2998	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002100	NB 18.000 INCHES	120	Metres		4820	578400
2999	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002200	NB 20.000 INCHES	2705	Metres		5360	14498800
3000	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002400	NB 24.000 INCHES	5930	Metres		6430	38129900
3001	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002500	NB 26.000 INCHES	1885	Metres		6960	13119600
3002	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002600	NB 28.000 INCHES	3885	Metres		7500	29137500
3003	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003002800	NB 32.000 INCHES	50	Metres		8570	428500
3004	B	B957-999-16-43-PK-SOR-9501-B-3M	M23003003200	NB 40.000 INCHES	1535	Metres		10710	16439850
3005	B	B957-999-16-43-PK-SOR-9501-B-3M	M23400000000	SUPPLY OF STUDS ALONG WITH NUTS: Supply as per Technical Notes for Fasteners (6-44-0057) from Vendor enlisted in Project Master Supplier List of Studs along with two nuts for diameter < 1" and 3 nuts for diamemter >= 1"of nuts, as per the direction of Engineer in-charge. All Alloy steel fasteners used in SS Piping shall be Hot Dip Galvanized.					
3006	B	B957-999-16-43-PK-SOR-9501-B-3M	M23401000000	AS FASTENERS (ASTM A193 GR.B7/B7M/A194 GR.2H/2HM)	0.13	Tonnes		241000	31330
3007	B	B957-999-16-43-PK-SOR-9501-B-3M	M23402000000	AS FASTENERS (ASTM A193 GR.B16/A194 GR.7)	0.07	Tonnes		241000	16870

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3008	B	B957-999-16-43-PK-SOR-9501-B-3M	M23403000000	AS (IMPACT TESTED) FASTENERS (ASTM A320 GR.L7/A194 GR.7)	0.07	Tonnes		262400	18368
3009	B	B957-999-16-43-PK-SOR-9501-B-3M	M23404000000	SS FASTENERS (ASTM A193 GR.B8/B8M/A194 GR.8/B8M)	0.07	Tonnes		482000	33740
3010	B	B957-999-16-43-PK-SOR-9501-B-3M	M23405000000	SS (IMPACT TESTED) FASTENERS (ASTM A320 GR.B8CL.2/A194 GR.8)	0.07	Tonnes		482000	33740
3011	B	B957-999-16-43-PK-SOR-9501-B-3M	M23406000000	SS (STRESS RUPTURE TESTED) FASTENERS (ASTM A453GR.660)	0.07	Tonnes		508800	35616
3012	B	B957-999-16-43-PK-SOR-9501-B-3M	M23700000000	MODIFICATION/EXTRA WORKS (IF ANY) :- Cutting, bevelling, fitup, welding of different sizes of CS/AS/SS/Higher Alloy piping of all types and thicknessess in shop, in position, on ground/overhead on rack and at all elevations; transportation of pipes, fittings, flanges etc from owners storage point to work site/ work shop, making necessary scaffoldings, consumables, machinery, tools, tackles, labour and supervision including attending repairs for completing the work as per the instruction of Engineer-in-charge.					
3013	B	B957-999-16-43-PK-SOR-9501-B-3M	M23701000000	FLAME CUTTING C.S PIPING IBR/NON IBR	3575	Inch Dia		250	893750
3014	B	B957-999-16-43-PK-SOR-9501-B-3M	M23702000000	HACKSAW CUTTING C.S PIPING IBR/NON IBR	1195	Inch Dia		270	322650
3015	B	B957-999-16-43-PK-SOR-9501-B-3M	M23703000000	BEVELLING C.S PIPING IBR/NON IBR	4765	Inch Dia		290	1381850
3016	B	B957-999-16-43-PK-SOR-9501-B-3M	M23704000000	FITUP & WELDING C.S PIPING IBR/NON IBR	4765	Inch Dia		700	3335500
3017	B	B957-999-16-43-PK-SOR-9501-B-3M	M23705000000	FLAME CUTTING S.S PIPING IBR/NON IBR	140	Inch Dia		340	47600
3018	B	B957-999-16-43-PK-SOR-9501-B-3M	M23706000000	HACKSAW CUTTING S.S PIPING IBR/NON IBR	50	Inch Dia		430	21500
3019	B	B957-999-16-43-PK-SOR-9501-B-3M	M23707000000	BEVELLING S.S PIPING IBR/NON IBR	190	Inch Dia		440	83600
3020	B	B957-999-16-43-PK-SOR-9501-B-3M	M23708000000	FITUP & WELDING S.S PIPING IBR/NON IBR	190	Inch Dia		1240	235600
3021	B	B957-999-16-43-PK-SOR-9501-B-3M	M23709000000	FLAME CUTTING A.S PIPING IBR/NON IBR	30	Inch Dia		310	9300
3022	B	B957-999-16-43-PK-SOR-9501-B-3M	M23710000000	HACKSAW CUTTING A.S PIPING IBR/NON IBR	10	Inch Dia		360	3600
3023	B	B957-999-16-43-PK-SOR-9501-B-3M	M23711000000	BEVELLING A.S PIPING IBR/NON IBR	40	Inch Dia		410	16400
3024	B	B957-999-16-43-PK-SOR-9501-B-3M	M23712000000	FITUP & WELDING A.S PIPING IBR/NON IBR	40	Inch Dia		1080	43200
3025	B	B957-999-16-43-PK-SOR-9501-B-3M	M23713000000	FLAME CUTTING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		490	2450
3026	B	B957-999-16-43-PK-SOR-9501-B-3M	M23714000000	HACKSAW CUTTING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		640	3200
3027	B	B957-999-16-43-PK-SOR-9501-B-3M	M23715000000	BEVELLING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		660	3300
3028	B	B957-999-16-43-PK-SOR-9501-B-3M	M23716000000	FITUP & WELDING NICKEL/MONEL/INCOLOY PIPING	5	Inch Dia		4780	23900
3029	B	B957-999-16-43-PK-SOR-9501-B-3M	M23717000000	FLAME CUTTING OF DUPLEX SS PIPING	5	Inch Dia		510	2550
3030	B	B957-999-16-43-PK-SOR-9501-B-3M	M23718000000	HACKSAW CUTTING OF DUPLEX SS PIPING	5	Inch Dia		640	3200
3031	B	B957-999-16-43-PK-SOR-9501-B-3M	M23719000000	BEVELLING OF DUPLEX SS PIPING	5	Inch Dia		660	3300
3032	B	B957-999-16-43-PK-SOR-9501-B-3M	M23720000000	FITUP & WELDING OF DUPLEX SS PIPING	5	Inch Dia		1860	9300
3033	B	B957-999-16-43-PK-SOR-9501-B-3M	M23800000000	REMOVAL ERECTED PIPING(ABOVE GROUND) :- Removal of piping existing/ erected including SW valves for modification as required as per Drawings/P and IDs/instructions of Engineer-in-charge at all elevations, including providing assistance to owner for draining, cleaning and purging of the lines to be removed , unbolting of flanged joints /cutting of pipe lines wherever required, installation of flanges and blind flanges, removal of insulation from insulated lines, removing supports, steam tracers, all fittings and flanges, instruments etc, cutting of pipes in appropriate length for transporting purposes, cleaning, flushing, drying and transporting all materials to storage point(within the complex battery limits) designated by Owner/EIL including stacking of material and disposing of waste etc as instructed by Engineer-in-charge.					
3034	B	B957-999-16-43-PK-SOR-9501-B-3M	M23801000000	C.S/A.S PIPING	5200	Inch M		370	1924000
3035	B	B957-999-16-43-PK-SOR-9501-B-3M	M23802000000	S.S PIPING	875	Inch M		650	568750
3036	B	B957-999-16-43-PK-SOR-9501-B-3M	M23803000000	NICKEL/MONEL/INCOLOY PIPING	5	Inch M		1250	6250
3037	B	B957-999-16-43-PK-SOR-9501-B-3M	M23804000000	DUPLEX SS PIPING	5	Inch M		990	4950
3038	B	B957-999-16-43-PK-SOR-9501-B-3M	M24100000000	LOW FRICTION PADS: Supply, fabrication and fixing of low friction pads with suitable bonding materials / fasteners, as specified in Drawings / Isometrics / Special support sketches.					
3039	B	B957-999-16-43-PK-SOR-9501-B-3M	M24101000000	TEFLON PAD WITH COMPRESSIVE STRENGTH (0.25 OFFSET) :1870 PSI	0.03	Cu. M		2635200	79056
3040	B	B957-999-16-43-PK-SOR-9501-B-3M	M24102000000	GRAPHITE PAD WITH COMPRESSIVE STRENGTH : 2877 PSI	0.04	Cu. M		2371700	94868
3041	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901000000	Digital Radiography: Performance of digital Radiographic inspection on Piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever elase even though not expressly mentioned but required to perform the work as per requirements of specification B957-000-6-42-WSP-0001 and instructions of Engineer in charge. Repeat Radiography due to defective radiograph on repaired joints due to contractor's fault and for additional radiography necessitated due to poor performance of contractor's welder shall be done at contractor's cost. Unit of radiography quantity is 'Nos. of circumferential weld joints'.					
3042	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901100000	FOR JOINTS THK. <= 8MM (FOR CSD46:D79 OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
3043	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901107000	NB 6.000 INCHES	158	Nos.		4430	699940
3044	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901200000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
3045	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901201000	NB 0.750 INCHES	2	Nos.		1050	2100
3046	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901202000	NB 1.000 INCHES	2	Nos.		1050	2100
3047	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901203000	NB 1.500 INCHES	1	Nos.		1570	1570
3048	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901204000	NB 2.000 INCHES	10	Nos.		2100	21000
3049	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901205000	NB 3.000 INCHES	63	Nos.		2220	139860
3050	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901206000	NB 6.000 INCHES	2	Nos.		4430	8860

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3051	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901207000	NB 8.000 INCHES	1	Nos.		5910	5910
3052	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901208000	NB 10.000 INCHES	3	Nos.		7390	22170
3053	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901300000	FOR JOINTS ABOVE THK. 8MM					
3054	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901301000	NB 0.750 INCHES	7	Nos.		1050	7350
3055	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901302000	NB 1.000 INCHES	4	Nos.		1050	4200
3056	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901303000	NB 2.000 INCHES	7	Nos.		2100	14700
3057	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901304000	NB 3.000 INCHES	24	Nos.		2220	53280
3058	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901305000	NB 4.000 INCHES	72	Nos.		2960	213120
3059	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901306000	NB 6.000 INCHES	52	Nos.		4430	230360
3060	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901307000	NB 8.000 INCHES	117	Nos.		5910	691470
3061	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901308000	NB 10.000 INCHES	53	Nos.		7390	391670
3062	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901309000	NB 12.000 INCHES	50	Nos.		8870	443500
3063	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901310000	NB 14.000 INCHES	1	Nos.		10350	10350
3064	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901311000	NB 16.000 INCHES	1	Nos.		11830	11830
3065	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901312000	NB 18.000 INCHES	20	Nos.		13300	266000
3066	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901313000	NB 20.000 INCHES	9	Nos.		14780	133020
3067	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901314000	NB 24.000 INCHES	160	Nos.		17740	2838400
3068	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901315000	NB 26.000 INCHES	7	Nos.		19220	134540
3069	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901316000	NB 28.000 INCHES	25	Nos.		20700	517500
3070	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901317000	NB 30.000 INCHES	1	NOs		22170	22170
3071	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901318000	NB 32.000 INCHES	3	Nos.		23650	70950
3072	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901319000	NB 36.000 INCHES	8	Nos.		26610	212880
3073	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901320000	NB 40.000 INCHES	1	Nos.		29570	29570
3074	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901321000	NB 56.000 INCHES	3	Nos.		41390	124170
3075	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901322000	NB 60.000 INCHES	9	Nos.		44350	399150
3076	B	B957-999-16-43-PK-SOR-9501-B-3M	M29901323000	NB 94.000 INCHES	6	Nos.		69480	416880
3077	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905000000	CLOSE PROXIMITY RADIOGRAPHY WITH "RADIOGRAPHY WITH SELENIUM-75 SOURCE USING SAFE RADIATION TECHNIQUE":- Performance of radiographic inspection on piping of all types & thicknesses including providing or hiring of all necessary equipment and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge by using "SELENIUM-75" source based radiography system. Radiographs shall be submitted to the Engineer in-charge. Repeat Radiography due to defective radiograph on repaired joints due to Contractor's fault and for additional radiography necessitated due to poor performance of contractor's welders shall be done at contractor's cost. Note: Unit for radiography quantity is "Nos of circumferential weld joints", and rates are also inclusive of scaffoldings wherever required radiography system. Radiographs shall be submitted to the Engineer in-charge.					
3078	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905100000	FOR JOINTS THK. <= 8MM (FOR CSD46:D79 OTHER THAN CLASS IV OF JOB NDE SPECIFICATION)					
3079	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905101000	NB 0.750 INCHES	1	Nos.		620	620
3080	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905102000	NB 1.000 INCHES	1	Nos.		620	620
3081	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905103000	NB 1.500 INCHES	1	Nos.		930	930
3082	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905104000	NB 2.000 INCHES	14	Nos.		1240	17360
3083	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905105000	NB 3.000 INCHES	28	Nos.		1860	52080
3084	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905106000	NB 4.000 INCHES	28	Nos.		2490	69720
3085	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905107000	NB 6.000 INCHES	31	Nos.		2890	89590
3086	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905200000	FOR JOINTS THK. <= 8MM (FOR CS AS PER CLASS IV OF JOB NDE SPECIFICATION/AS/SS)					
3087	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905201000	NB 0.750 INCHES	1	Nos.		620	620
3088	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905202000	NB 1.000 INCHES	1	Nos.		620	620
3089	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905203000	NB 1.500 INCHES	1	Nos.		930	930
3090	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905204000	NB 2.000 INCHES	3	Nos.		1240	3720
3091	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905205000	NB 3.000 INCHES	12	Nos.		1860	22320
3092	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905206000	NB 6.000 INCHES	1	Nos.		2890	2890
3093	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905207000	NB 8.000 INCHES	1	Nos.		3860	3860
3094	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905208000	NB 10.000 INCHES	1	Nos.		4820	4820
3095	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905209000	NB 14.000 INCHES	3	Nos.		6750	20250
3096	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905300000	FOR JOINTS ABOVE THK. 8MM					
3097	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905301000	NB 0.750 INCHES	2	Nos.		620	1240
3098	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905302000	NB 1.000 INCHES	1	Nos.		620	620
3099	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905303000	NB 2.000 INCHES	2	Nos.		1240	2480

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3100	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905304000	NB 3.000 INCHES	7	Nos.		1860	13020
3101	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905305000	NB 4.000 INCHES	19	Nos.		2490	47310
3102	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905306000	NB 6.000 INCHES	13	Nos.		2890	37570
3103	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905307000	NB 8.000 INCHES	30	Nos.		3860	115800
3104	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905308000	NB 10.000 INCHES	13	Nos.		4820	62660
3105	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905309000	NB 12.000 INCHES	13	Nos.		5780	75140
3106	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905310000	NB 14.000 INCHES	3	Nos.		6750	20250
3107	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905311000	NB 16.000 INCHES	3	Nos.		7710	23130
3108	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905312000	NB 18.000 INCHES	6	Nos.		8680	52080
3109	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905313000	NB 20.000 INCHES	2	Nos.		9640	19280
3110	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905314000	NB 24.000 INCHES	41	Nos.		11570	474370
3111	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905315000	NB 26.000 INCHES	2	Nos.		12530	25060
3112	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905316000	NB 28.000 INCHES	7	Nos.		13500	94500
3113	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905317000	NB 30.000 INCHES	1	NOs		14460	14460
3114	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905318000	NB 32.000 INCHES	1	Nos.		15430	15430
3115	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905319000	NB 36.000 INCHES	2	Nos.		15910	31820
3116	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905320000	NB 40.000 INCHES	1	Nos.		19280	19280
3117	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905321000	NB 56.000 INCHES	1	Nos.		26990	26990
3118	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905322000	NB 60.000 INCHES	2	Nos.		28920	57840
3119	B	B957-999-16-43-PK-SOR-9501-B-3M	M29905323000	NB 94.000 INCHES	2	Nos.		45310	90620
3120	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906000000	External cleaning of SS welds as per specification:B957-000-06-42-CCS-011. includng supply of spares, laboratory facilities, with all accessories for conducting test, chemicals, safety accessories and also providing or hiring all necessary equipment and whatever else even though not expressly mentioned herein and in specificaions but required to perform the work as per job specifications and instructions of Engineer-in-Charge. (Unit of Measurement is No. of joints.)					
3121	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906001000	NB 0.50 INCHES	4	Nos.		70	280
3122	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906002000	NB 0.750 INCHES	55	Nos.		70	3850
3123	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906003000	NB 1.000 INCHES	55	Nos.		70	3850
3124	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906004000	NB 1.500 INCHES	17	Nos.		120	2040
3125	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906005000	NB 2.000 INCHES	55	Nos.		160	8800
3126	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906006000	NB 3.000 INCHES	55	Nos.		240	13200
3127	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906007000	NB 4.000 INCHES	55	Nos.		310	17050
3128	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906008000	NB 6.000 INCHES	55	Nos.		470	25850
3129	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906009000	NB 8.000 INCHES	55	Nos.		620	34100
3130	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906010000	NB 10.000 INCHES	55	Nos.		780	42900
3131	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906011000	NB 12.000 INCHES	55	Nos.		940	51700
3132	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906012000	NB 14.000 INCHES	55	Nos.		1090	59950
3133	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906013000	NB 16.000 INCHES	1	Nos.		1200	1200
3134	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906014000	NB 18.000 INCHES	1	Nos.		1350	1350
3135	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906015000	NB 20.000 INCHES	1	Nos.		1500	1500
3136	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906016000	NB 24.000 INCHES	1	Nos.		1800	1800
3137	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906017000	NB 28.000 INCHES	28	Nos.		2100	58800
3138	B	B957-999-16-43-PK-SOR-9501-B-3M	M29906018000	NB 30.000 INCHES	28	Nos.		2250	63000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3139	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907000000	HOT TAPPING WORKS: The Hook Ups shall be carried out, as per the requirement of Client/Engineer in Charge with the fluid on stream inside the existing line (HOT TAPPING). All the activities described in SOR item and relevant sections of Piping Scope of work shall be in addition to this SOR item. Removal of painting with wire brush and cleaning the spot of hot tapping and offer for inspection. After inspection clearance, weld a "shop hydrotested stub" of specified dia and length as per the specification to the main line.After the clearance of hydro test, welding of RF Pad on the stub /main line and carry out leak test at a pressure of 1.25 kg/cm2. The stub has to be pre-fabricated before taking hot tapping as per specification and instruction of Engineer in charge. Installation of a valve on the stub welded on the main line. The valve is required to be hydro-tested in the shop prior to field erection. Completion of Hot-Tapping work including supply and arranging of hot Tapping machine, cutter, Split Tee (if required) and also taking out the cut piece of pipe shall be under the scope of contractor. Installation of a blind flange on the open end of valves, if required, after removal of hot tapping machine shall be by contractor. All materials (excluding split Tee) for hookup like RF pad, stub in pipe, valves, flanges, gaskets, stub, nuts, blind flanges, etc. to be supplied by the Owner. Split-Tee shall be supplied by the Contractor. Notes: 1)The rate given in the SOR for hot tapping shall be inclusive of pre-fabrication and installation of stub to the header and its hydro-test, fabrication and welding of RF Pad and its air test including supply of compressor for air test, lug grinding (if required)/supply and welding of Split-Tee and installation of valve on the welded stub, fabrication and installation of blind flange on open end of the valve after the completion of the hot tapping works and removal of hot tapping machine supplied by contractor, transportation of equipment, materials, etc. and all other items required but not limited to mentioned for completion of the work. 2) The rate is inclusive of scaffolding /barricading as required for carrying out hot tapping at all elevations. The Scaffolding has to be erected in such a way that two separate and independent access will be available for the temporary platforms at all elevations erected for Hot Tapping. The Contractor shall supply, fabricate and erect all the structural members and arrangements required for providing: a) support to the existing line/main line on to which the Hot Tapping is made b) working platform for Hot Tapping personnel c) Access to Hot Tapping platform where Hot Tapping personnel are deployed					
3140	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907010000	NB 2.0 INCH - 6.0 INCH	1	Nos.		389920	389920
3141	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907020000	NB 8.0 INCH - 14.0 INCH	1	Nos.		746630	746630
3142	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907030000	NB 16.0 INCH - 24.0 INCH	1	Nos.		1707490	1707490
3143	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907040000	NB 26.0 INCH - 36.0 INCH	1	Nos.		3726700	3726700
3144	B	B957-999-16-43-PK-SOR-9501-B-3M	M29907050000	ABOVE 36.0 INCH	1	Nos.		3744920	3744920
3145	B	B957-999-16-43-PK-SOR-9501-B-3M	M40000000000	PAINTING (OFFSITES) :- Supply of paints and primers, preparation of surfaces and application of primer and finish paints, identification (Line numbering), lettering, colour bands, colour coding etc. as specified including rubdown and touch up of shop primer wherever required, providing scaffolding for all heights, labour, material, tools and tackles, consumables supervision etc. to complete the work in all respects as per EIL painting spec., drawings and direction of Engineer-in-Charge for all types of uninsulated piping and insulated piping as specified including all pipes, fittings, flanges, supports, valves etc. Surface preparation by blast cleaning and application of first coat of primer (inorganic zinc silicate, F9) shall be done in fabrication yard prior to erection. For insulated piping wherever blast cleaning with no primer application is specified, in such cases finish paints shall also be applied in the fabrication yard. The identification marks of the piping and joints shall be noted before blasting and the same shall be transferred on primed surface with Polyurethane paint (F2) or as per the instructions of Engineer-in-Charge. Notes: 1. All joints (fabrication as well as erection joints) shall be left unpainted till hydrotesting. 2. No extra payment shall be made for identification (line numbering etc.) of insulated and uninsulated lines.					
3146	B	B957-999-16-43-PK-SOR-9501-B-3M	M49100000000	PAINTING OF UNINSULATED PIPING FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 5 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR CS/LTCS/AS.					
3147	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101000000	DESIGN TEMP GROUP: -45 TO -15(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat, Intermediate Coat: None, Finish Coat: None, Total Final DFT in Microns (min.): 65-75 mu.					
3148	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010000	PIPES					
3149	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010400	NB: .5 Inches	5	Metres		30	150
3150	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010500	NB: .75 Inches	5	Metres		40	200
3151	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010600	NB: 1 Inches	135	Metres		50	6750
3152	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010800	NB: 1.5 Inches	5	Metres		70	350
3153	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101010900	NB: 2 Inches	165	Metres		90	14850
3154	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101011500	NB: 6 Inches	140	Metres		240	33600
3155	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101011600	NB: 8 Inches	370	Metres		310	114700
3156	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101011800	NB: 12 Inches	5	Metres		460	2300
3157	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101012000	NB: 16 Inches	330	Metres		570	188100
3158	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101012100	NB: 18 Inches	600	Metres		650	390000
3159	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101012800	NB: 32 Inches	20	Metres		1150	23000
3160	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101013600	NB: 48 Inches	5	Metres		1720	8600
3161	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101020000	VALVES					
3162	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101021500	NB: 6 Inches	3	Nos.		360	1080
3163	B	B957-999-16-43-PK-SOR-9501-B-3M	M49101021600	NB: 8 Inches	2	Nos.		460	920

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3164	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102000000	DESIGN TEMP GROUP: -14 TO 80(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat + 1 coat of P-6 @ 40 mu DFT/ coat, Intermediate Coat: 1 coat of F-6B @ 100 mu DFT/coat, Finish Coat: 1 coat of F-2 @ 40 mu DFT/coat, Total Final DFT in Microns (min.): 245-255 mu.					
3165	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010000	PIPES					
3166	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010400	NB: .5 Inches	5	Metres		60	300
3167	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010500	NB: .75 Inches	175	Metres		80	14000
3168	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010600	NB: 1 Inches	1535	Metres		100	153500
3169	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010800	NB: 1.5 Inches	270	Metres		140	37800
3170	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102010900	NB: 2 Inches	7635	Metres		180	1374300
3171	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011100	NB: 3 Inches	8820	Metres		260	2293200
3172	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011300	NB: 4 Inches	19945	Metres		340	6781300
3173	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011500	NB: 6 Inches	11400	Metres		500	5700000
3174	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011600	NB: 8 Inches	9110	Metres		650	5921500
3175	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011700	NB: 10 Inches	1460	Metres		810	1182600
3176	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011800	NB: 12 Inches	2890	Metres		970	2803300
3177	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102011900	NB: 14 Inches	2180	Metres		1060	2310800
3178	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012000	NB: 16 Inches	925	Metres		1210	1119250
3179	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012100	NB: 18 Inches	1260	Metres		1360	1713600
3180	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012200	NB: 20 Inches	1210	Metres		1510	1827100
3181	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012400	NB: 24 Inches	515	Metres		1820	937300
3182	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012600	NB: 28 Inches	1675	Metres		2120	3551000
3183	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012700	NB: 30 Inches	5	Metres		2270	11350
3184	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102012800	NB: 32 Inches	55	Metres		2420	133100
3185	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102013200	NB: 40 Inches	1210	Metres		3030	3666300
3186	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102020000	VALVES					
3187	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102020900	NB: 2 Inches	89	Nos.		270	24030
3188	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021100	NB: 3 Inches	91	Nos.		400	36400
3189	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021300	NB: 4 Inches	60	Nos.		510	30600
3190	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021500	NB: 6 Inches	69	Nos.		750	51750
3191	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021600	NB: 8 Inches	20	Nos.		980	19600
3192	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021700	NB: 10 Inches	2	Nos.		1220	2440
3193	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102021800	NB: 12 Inches	10	Nos.		1450	14500
3194	B	B957-999-16-43-PK-SOR-9501-B-3M	M49102022000	NB: 16 Inches	5	Nos.		1820	9100
3195	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103000000	DESIGN TEMP GROUP: 81 TO 250(DEG C)Surface Preparation & Pre-erection/Shop Primer: SSPC-SP-10; 1coat of F-9 @ 65-75 mu DFT/coat + 1 coats of F-11 @ 20 mu DFT/coat, Intermediate Coat: None, Finish Coat: 1 coats of F- 11 @ 20 mu DFT/coat, Total Final DFT in Microns (min.): 105-115 mu.					
3196	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103010000	PIPES					
3197	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103010500	NB: .75 Inches	25	Metres		60	1500
3198	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103010600	NB: 1 Inches	50	Metres		80	4000
3199	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103010800	NB: 1.5 Inches	5	Metres		120	600
3200	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103010900	NB: 2 Inches	2110	Metres		150	316500
3201	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103011100	NB: 3 Inches	3255	Metres		220	716100
3202	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103011300	NB: 4 Inches	6355	Metres		280	1779400
3203	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103011500	NB: 6 Inches	4725	Metres		410	1937250
3204	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103011600	NB: 8 Inches	2410	Metres		530	1277300
3205	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103011700	NB: 10 Inches	70	Metres		660	46200
3206	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103012100	NB: 18 Inches	65	Metres		1100	71500
3207	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103012800	NB: 32 Inches	210	Metres		1970	413700
3208	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103013600	NB: 48 Inches	1385	Metres		2940	4071900
3209	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103014000	NB: 56 Inches	645	Metres		3440	2218800
3210	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103020000	VALVES					
3211	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103020900	NB: 2 Inches	28	Nos.		220	6160
3212	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103021300	NB: 4 Inches	21	Nos.		410	8610
3213	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103021500	NB: 6 Inches	7	Nos.		610	4270
3214	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103021600	NB: 8 Inches	2	Nos.		790	1580
3215	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103021700	NB: 10 Inches	2	Nos.		990	1980

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3216	B	B957-999-16-43-PK-SOR-9501-B-3M	M49103022100	NB: 18 Inches	5	Nos.		1660	8300
3217	B	B957-999-16-43-PK-SOR-9501-B-3M	M49200000000	PAINTING OF INSULATED PIPING OF CS & AS FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 11 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR CS/LTCS/AS.					
3218	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201000000	DESIGN TEMP GROUP: -45 TO 125(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-10; 1coat of F-15 @ 100 mu DFT/coat, Primer: None, Finish paint: 2 coats of F-15 @ 100 mu DFT/coat, Total DFT 300 mu.					
3219	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010000	PIPES					
3220	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010400	NB: .5 Inches	5	Metres		60	300
3221	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010500	NB: .75 Inches	75	Metres		70	5250
3222	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010600	NB: 1 Inches	165	Metres		90	14850
3223	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010800	NB: 1.5 Inches	5	Metres		130	650
3224	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201010900	NB: 2 Inches	500	Metres		160	80000
3225	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011100	NB: 3 Inches	3440	Metres		240	825600
3226	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011300	NB: 4 Inches	2640	Metres		310	818400
3227	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011500	NB: 6 Inches	3420	Metres		450	1539000
3228	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011600	NB: 8 Inches	3300	Metres		590	1947000
3229	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011700	NB: 10 Inches	7300	Metres		730	5329000
3230	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011800	NB: 12 Inches	3450	Metres		870	3001500
3231	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201011900	NB: 14 Inches	200	Metres		950	190000
3232	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201012100	NB: 18 Inches	615	Metres		1220	750300
3233	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201012400	NB: 24 Inches	410	Metres		1630	668300
3234	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201020000	VALVES					
3235	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201020900	NB: 2 Inches	56	Nos.		240	13440
3236	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021100	NB: 3 Inches	17	Nos.		360	6120
3237	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021300	NB: 4 Inches	13	Nos.		460	5980
3238	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021500	NB: 6 Inches	61	Nos.		680	41480
3239	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021600	NB: 8 Inches	35	Nos.		880	30800
3240	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021700	NB: 10 Inches	17	Nos.		1100	18700
3241	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021800	NB: 12 Inches	18	Nos.		1300	23400
3242	B	B957-999-16-43-PK-SOR-9501-B-3M	M49201021900	NB: 14 Inches	5	Nos.		1430	7150
3243	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202000000	DESIGN TEMP GROUP: 126 TO 560(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-10; 1 coat of F-16 @ 125 mu DFT/coat, Primer: None, Finish paint: 1 coat F-16 @ 125 mu DFT/coat, Total DFT: 250 mu.					
3244	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010000	PIPES					
3245	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010400	NB: .5 Inches	5	Metres		80	400
3246	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010500	NB: .75 Inches	15	Metres		100	1500
3247	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010600	NB: 1 Inches	100	Metres		130	13000
3248	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010800	NB: 1.5 Inches	5	Metres		180	900
3249	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202010900	NB: 2 Inches	970	Metres		230	223100
3250	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202011100	NB: 3 Inches	1735	Metres		330	572550
3251	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202011300	NB: 4 Inches	1005	Metres		430	432150
3252	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202011500	NB: 6 Inches	2705	Metres		630	1704150
3253	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202011600	NB: 8 Inches	6720	Metres		820	5510400
3254	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202011800	NB: 12 Inches	1360	Metres		1220	1659200
3255	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202012000	NB: 16 Inches	1165	Metres		1530	1782450
3256	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202012400	NB: 24 Inches	1370	Metres		2290	3137300
3257	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202020000	VALVES					
3258	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202020900	NB: 2 Inches	16	Nos.		340	5440
3259	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202021100	NB: 3 Inches	18	Nos.		500	9000
3260	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202021300	NB: 4 Inches	12	Nos.		640	7680
3261	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202021500	NB: 6 Inches	6	Nos.		950	5700
3262	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202021600	NB: 8 Inches	2	Nos.		1240	2480
3263	B	B957-999-16-43-PK-SOR-9501-B-3M	M49202021800	NB: 12 Inches	5	Nos.		1830	9150
3264	B	B957-999-16-43-PK-SOR-9501-B-3M	M49300000000	PAINTING OF INSULATED PIPING OF SS & MS FOR 'COROSSIVE' ENVIRONMENT AS PER TABLE 11 OF JOB SPEC B957-000-6-42-PLS-01 REV 2 FOR SS/MS.					
3265	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301000000	DESIGN TEMP GROUP: -45 TO 125(DEG C)Surface preparation & Pre-erection / Shop primer:SSPC-SP-16; (15-25 mu surface profile) 1 coat of F-15 @100 mu DFT/coat, Primer: None, Finish paint: 2 coats of F-15 @ 100 mu DFT/coat, Total DFT: 300 mu.					
3266	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301010000	PIPES					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3267	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301010600	NB: 1 Inches	5	Metres		90	450
3268	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301011300	NB: 4 Inches	20	Metres		310	6200
3269	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301011500	NB: 6 Inches	1440	Metres		450	648000
3270	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301020000	VALVES					
3271	B	B957-999-16-43-PK-SOR-9501-B-3M	M49301021300	NB: 4 Inches	3	Nos.		460	1380
3272	B	B957-999-16-43-PK-SOR-9501-B-3M	M5**********	********** LEGENDS / NOTES FOR INSULATION WORKS ********** ** Types of Insulation : IH = Insulation for Heat Conservation IT = Insulation for Steam Traced Lines IS = Insulation for Personal Safety IC = Cold Insulation for Anti-condensation IE = Insulation for Electrically Traced Lines IJ = Insulation for Jacketed Lines IK = Insulation for Dual Insulated Lines ** Basic Line Surface Materials : CS = Carbon Steel (Including LT Carbon Steel) AS = Alloy Steel SS = Stainless Steel ** Notes : 1. For insulation type IT,tracer size and tracer numbers shall be as per specification. 2. Insulation thickness for IC where insulation material is Poly Urethane foam (PUF) / Poly Isocyanurate (PIC) + Cellular Glass includes outer layer of 50mm of Cellular Glass and Inner layer of balance thickness of PUF/PIC 3. Insulation for IE consists of inner layer of Rockwool and outer layer of PUF / PIC. The thicknesses have been specified as THK(I) and THK(O) for inner and outer layers respectively. **********					
3273	B	B957-999-16-43-PK-SOR-9501-B-3M	M60000000000	HOT INSULATION (OFFSITES): Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party(LIyods/BV/DNV or any other Client approved party)at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with sheet cladding as per spec. , providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
3274	B	B957-999-16-43-PK-SOR-9501-B-3M	M60100000000	INSULATION MATERIAL : ROCKWOOL					
3275	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL					
3276	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010000	PIPES					
3277	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010408	NB 00.50 INCHES; THICKNESS 40 MM	10	Metres		2070	20700
3278	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010505	NB 00.75 INCHES; THICKNESS 25 MM	20	Metres		1540	30800
3279	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010508	NB 00.75 INCHES; THICKNESS 40 MM	10	Metres		2190	21900
3280	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010605	NB 01.00 INCHES; THICKNESS 25 MM	10	Metres		1670	16700
3281	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010608	NB 01.00 INCHES; THICKNESS 40 MM	105	Metres		2340	245700
3282	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010808	NB 01.50 INCHES; THICKNESS 40 MM	10	Metres		2660	26600
3283	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010905	NB 02.00 INCHES; THICKNESS 25 MM	475	Metres		2230	1059250
3284	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101010908	NB 02.00 INCHES; THICKNESS 40 MM	690	Metres		2930	2021700
3285	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011105	NB 03.00 INCHES; THICKNESS 25 MM	520	Metres		2830	1471600
3286	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011108	NB 03.00 INCHES; THICKNESS 40 MM	420	Metres		3540	1486800
3287	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011305	NB 04.00 INCHES; THICKNESS 25 MM	520	Metres		3350	1742000
3288	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011308	NB 04.00 INCHES; THICKNESS 40 MM	20	Metres		4090	81800
3289	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011505	NB 06.00 INCHES; THICKNESS 25 MM	3950	Metres		4470	17656500
3290	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011508	NB 06.00 INCHES; THICKNESS 40 MM	10	Metres		5260	52600
3291	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011605	NB 08.00 INCHES; THICKNESS 25 MM	995	Metres		5520	5492400
3292	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011610	NB 08.00 INCHES; THICKNESS 50 MM	1085	Metres		6960	7551600
3293	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011705	NB 10.00 INCHES; THICKNESS 25 MM	1620	Metres		6630	10740600
3294	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011805	NB 12.00 INCHES; THICKNESS 25 MM	785	Metres		7690	6036650
3295	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101011810	NB 12.00 INCHES; THICKNESS 50 MM	680	Metres		9300	6324000
3296	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101012010	NB 16.00 INCHES; THICKNESS 50 MM	650	Metres		11150	7247500
3297	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101020000	FLANGE ASSEMBLIES					
3298	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101020808	NB 01.50 INCHES; THICKNESS 40 MM	1	NOs		2660	2660
3299	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101020908	NB 02.00 INCHES; THICKNESS 40 MM	1	NOs		2930	2930

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3300	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101021610	NB 08.00 INCHES; THICKNESS 50 MM	1	NOs		6960	6960
3301	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101021810	NB 12.00 INCHES; THICKNESS 50 MM	1	NOs		9300	9300
3302	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030000	BLIND FLANGE ASSEMBLIES					
3303	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030505	NB 00.75 INCHES; THICKNESS 25 MM	3	NOs		1540	4620
3304	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030508	NB 00.75 INCHES; THICKNESS 40 MM	8	NOs		2190	17520
3305	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030605	NB 01.00 INCHES; THICKNESS 25 MM	3	NOs		1670	5010
3306	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030608	NB 01.00 INCHES; THICKNESS 40 MM	6	NOs		2340	14040
3307	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030905	NB 02.00 INCHES; THICKNESS 25 MM	3	NOs		2230	6690
3308	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101030908	NB 02.00 INCHES; THICKNESS 40 MM	3	NOs		2930	8790
3309	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101031108	NB 03.00 INCHES; THICKNESS 40 MM	3	NOs		3540	10620
3310	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101031308	NB 04.00 INCHES; THICKNESS 40 MM	23	NOs		4090	94070
3311	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101031508	NB 06.00 INCHES; THICKNESS 40 MM	12	NOs		5260	63120
3312	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040000	VALVE ASSEMBLIES					
3313	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040408	NB 00.50 INCHES; THICKNESS 40 MM	2	NOs		4150	8300
3314	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040505	NB 00.75 INCHES; THICKNESS 25 MM	7	NOs		3070	21490
3315	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040508	NB 00.75 INCHES; THICKNESS 40 MM	13	NOs		4380	56940
3316	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040605	NB 01.00 INCHES; THICKNESS 25 MM	3	NOs		3350	10050
3317	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040608	NB 01.00 INCHES; THICKNESS 40 MM	10	NOs		4680	46800
3318	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040905	NB 02.00 INCHES; THICKNESS 25 MM	10	NOs		4460	44600
3319	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101040908	NB 02.00 INCHES; THICKNESS 40 MM	7	NOs		5850	40950
3320	B	B957-999-16-43-PK-SOR-9501-B-3M	M60101041810	NB 12.00 INCHES; THICKNESS 50 MM	2	NOs		18590	37180
3321	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 176 (DEG C) TO 350 (DEG C); INSULATION MATERIAL : ROCKWOOL					
3322	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102010000	PIPES					
3323	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102011313	NB 04.00 INCHES; THICKNESS 65 MM	10	Metres		4240	42400
3324	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102011513	NB 06.00 INCHES; THICKNESS 65 MM	325	Metres		5240	1703000
3325	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102030000	BLIND FLANGE ASSEMBLIES					
3326	B	B957-999-16-43-PK-SOR-9501-B-3M	M60102031313	NB 04.00 INCHES; THICKNESS 65 MM	6	NOs		4240	25440
3327	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103000000	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : ROCKWOOL					
3328	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103010000	PIPES					
3329	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103011318	NB 04.00 INCHES; THICKNESS 90 MM	10	Metres		5390	53900
3330	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103011620	NB 08.00 INCHES; THICKNESS 100 MM	525	Metres		8070	4236750
3331	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103011830	NB 12.00 INCHES; THICKNESS 150 MM	15	Metres		13610	204150
3332	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103012023	NB 16.00 INCHES; THICKNESS 115 MM	550	Metres		13050	7177500
3333	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103012433	NB 24.00 INCHES; THICKNESS 165 MM	1335	Metres		21940	29289900
3334	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103030000	BLIND FLANGE ASSEMBLIES					
3335	B	B957-999-16-43-PK-SOR-9501-B-3M	M60103031318	NB 04.00 INCHES; THICKNESS 90 MM	9	NOs		5390	48510
3336	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133000000	INSULATION TYPE : IS; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL					
3337	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133010000	PIPES					
3338	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133010505	NB 00.75 INCHES; THICKNESS 25 MM	10	Metres		1540	15400
3339	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133010805	NB 01.50 INCHES; THICKNESS 25 MM	10	Metres		1990	19900
3340	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133010905	NB 02.00 INCHES; THICKNESS 25 MM	15	Metres		2230	33450
3341	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133011105	NB 03.00 INCHES; THICKNESS 25 MM	205	Metres		2830	580150
3342	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133011305	NB 04.00 INCHES; THICKNESS 25 MM	205	Metres		3350	686750
3343	B	B957-999-16-43-PK-SOR-9501-B-3M	M60133011605	NB 08.00 INCHES; THICKNESS 25 MM	10	Metres		5520	55200
3344	B	B957-999-16-43-PK-SOR-9501-B-3M	M62200000000	INSULATION MATERIAL : ROCKWOOL+PIC					
3345	B	B957-999-16-43-PK-SOR-9501-B-3M	M65454000000	INSULATION TYPE : IJ; SURFACE MATERIAL : SS; OPERATING TEMP. RANGE : 176 (DEG C) TO 350 (DEG C)					
3346	B	B957-999-16-43-PK-SOR-9501-B-3M	M65454010000	PIPES					
3347	B	B957-999-16-43-PK-SOR-9501-B-3M	M654540104DA	NB 0.50 INCHES; THK(I) 40 MM; THK(O) 25 MM	115	Metres		3950	454250

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3348	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000000	HOT INSULATION (OFFSITES) ; Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with sheet cladding as per spec. , providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
3349	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000010	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e. 290 mm calcium silicate linner layer) & 75 mm In Situ-PUF (Outer layer) with 50 micron Mylar foil between inner & outer layers of Insulation to be considered for VHP steam headers. As per Job Spec: B957-420-06-43-IL01					
3350	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000020	PIPES					
3351	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000030	NB 0.5 INCH - 1.5 INCH	15	Metres		9440	141600
3352	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000040	NB 2 INCH - 6 INCH	15	Metres		15860	237900
3353	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000050	NB 8 INCH - 14 INCH	25	Metres		29890	747250
3354	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000060	NB 16 INCH - 24 INCH	1210	Metres		43610	52768100
3355	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000070	BLIND FLANGE ASSEMBLIES					
3356	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000080	NB 8 INCH - 14 INCH	30	Nos.		29890	896700
3357	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000090	NB 8 INCH - 14 INCH	1	Nos.		29890	29890
3358	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000100	NB 16 INCH - 24 INCH	2	Nos.		43610	87220
3359	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000110	VALVE ASSEMBLIES					
3360	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000120	NB 8 INCH - 14 INCH	1	Nos.		59780	59780
3361	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000130	NB 16 INCH - 24 INCH	2	Nos.		87230	174460
3362	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000140	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 125 mm Rockwool (Inner layer) & 15 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer) to be provided. As per Job Spec: B957-420-06-43-IL01					
3363	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000150	PIPES					
3364	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000160	NB 8 INCH - 14 INCH	590	Metres		26700	15753000
3365	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000165	NB 16 INCH - 24 INCH	95	Metres		40680	3864600
3366	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000170	BLIND FLANGE ASSEMBLIES					
3367	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000180	NB 8 INCH - 14 INCH	12	Nos.		26700	320400
3368	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000190	VALVE ASSEMBLIES					
3369	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000200	NB 8 INCH - 14 INCH	1	Nos.		53390	53390
3370	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000210	NB 16 INCH - 24 INCH	2	Nos.		81360	162720
3371	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000220	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 115 mm Rockwool (Inner layer) & 15 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer)to be provided. As per Job Spec: B957-420-06-43-IL01					
3372	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000230	PIPES					
3373	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000240	NB 2 INCH - 6 INCH	325	Metres		12100	3932500
3374	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000250	NB 8 INCH - 14 INCH	1810	Metres		26280	47566800
3375	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000260	NB 16 INCH - 24 INCH	25	Metres		40140	1003500
3376	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000270	BLIND FLANGE ASSEMBLIES					
3377	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000280	NB 2 INCH - 6 INCH	37	Nos.		12100	447700
3378	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000290	VALVE ASSEMBLIES					
3379	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000300	NB 8 INCH - 14 INCH	1	Nos.		52560	52560
3380	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000310	NB 16 INCH - 24 INCH	2	Nos.		80280	160560
3381	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000320	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL : Special insulation i.e. 75 mm Rockwool (Inner layer) & 10 mm Aerogel (Middle layer) & 75 mm PIR (Outer layer) to be provided for all LP steam lines. As per Job Spec: B957-420-06-43-IL01					
3382	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000330	PIPES					
3383	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000340	NB 0.5 INCH - 1.5 INCH	100	Metres		5270	527000
3384	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000350	NB 2 INCH - 6 INCH	1120	Metres		9370	10494400
3385	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000360	NB 8 INCH - 14 INCH	1680	Metres		20220	33969600
3386	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000370	NB 16 INCH - 28 INCH	610	Metres		30760	18763600
3387	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000380	BLIND FLANGE ASSEMBLIES					
3388	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000390	NB 0.5 INCH - 1.5 INCH	2	Nos.		5270	10540

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3389	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000400	NB 2 INCH - 6 INCH	43	Nos.		9370	402910
3390	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000410	NB 8 INCH - 14 INCH	6	Nos.		20220	121320
3391	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000420	NB 16 INCH - 24 INCH	6	Nos.		30760	184560
3392	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000430	NB 26 INCH - 32 INCH	6	Nos.		44220	265320
3393	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000440	VALVE ASSEMBLIES					
3394	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000450	NB 8 INCH - 14 INCH	1	Nos.		40430	40430
3395	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000460	NB 16 INCH - 24 INCH	2	Nos.		61510	123020
3396	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000470	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 176 (DEG C) TO 350 (DEG C); INSULATION MATERIAL : Special insulation i.e. 100 mm Rockwool (Inner layer) & 10 mm Aerogel (Middle layer) & 75 mm PUF (Outer layer) to be provided for all MP steam lines. As per Job Spec: B957-420-06-43-IL01					
3397	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000480	PIPES					
3398	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000490	NB 0.5 INCH - 1.5 INCH	460	Metres		5800	2668000
3399	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000500	NB 2 INCH - 6 INCH	745	Metres		9710	7233950
3400	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000510	NB 8 INCH - 14 INCH	595	Metres		20060	11935700
3401	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000520	NB 16 INCH - 26 INCH	2195	Metres		30100	66069500
3402	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000530	BLIND FLANGE ASSEMBLIES					
3403	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000540	NB 0.5 INCH - 1.5 INCH	3	Nos.		5800	17400
3404	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000550	NB 2 INCH - 6 INCH	2	Nos.		9710	19420
3405	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000560	VALVE ASSEMBLIES					
3406	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000570	NB 0.5 INCH - 1.5 INCH	7	Nos.		11610	81270
3407	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000580	NB 2 INCH - 6 INCH	2	Nos.		19420	38840
3408	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000590	NB 8 INCH - 14 INCH	2	Nos.		40120	80240
3409	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000600	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : Special insulation i.e. 40 mm calcium silicate (Inner layer), Mylar foil (Intermediate foil between Inner and Outer Layer), 60 mm In-Situ PUF (Outer Layer) for LP steam headers. As per Job Spec: B957-420-06-43-IL01					
3410	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000610	NB 0.5 INCH - 1.5 INCH	58			3070	178060
3411	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000620	NB 8 INCH - 14 INCH	1035			9610	9946350
3412	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000630	INSULATION TYPE : IH; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : 351 (DEG C) TO 500 (DEG C); INSULATION MATERIAL : Special insulation i.e 125 mm Rockwool (Inner layer) & 75 mmPIR (Outer Layer) to be provided. As per Job Spec: B957-420-06-43-IL01					
3413	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000640	NB 8 INCH - 14 INCH	60	Metres		13530	811800
3414	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000650	NB 16 INCH - 24 INCH	415	Metres		18980	7876700
3415	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000660	VALVE ASSEMBLIES					
3416	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000670	NB 0.5 INCH - 1.5 INCH	7	NOs		10980	76860
3417	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000680	NB 2 INCH - 6 INCH	2	NOs		15240	30480
3418	B	B957-999-16-43-PK-SOR-9501-B-3M	M69900000690	NB 8 INCH - 14 INCH	2	NOs		27060	54120
3419	B	B957-999-16-43-PK-SOR-9501-B-3M	M80000000000	INSULATION OF ELETRICAL TRACED LINES (OFFSITES): Providing thermal insulation including supply of all insulating and ancillary materials, vapour barrier, weather protective coverings, consumable and other necessary materials ,testing of materials as required, including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory work there on, all binding, tying, lacing, stitching and/or otherwise securing , finishing with cladding as per spec., providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer- in-charge. (Refer Legend for applicable EIL specification)					
3420	B	B957-999-16-43-PK-SOR-9501-B-3M	M82000000000	INSULATION MATERIAL : ROCKWOOL+PUF OR ROCKWOOL+PIC					
3421	B	B957-999-16-43-PK-SOR-9501-B-3M	M82057000000	INSULATION TYPE : IE; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C); INSULATION MATERIAL : ROCKWOOL+PUF OR ROCKWOOL+PIC					
3422	B	B957-999-16-43-PK-SOR-9501-B-3M	M82057010000	PIPES					
3423	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570104AA	NB 00.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	10	Metres		2510	25100
3424	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570105AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	65	Metres		2640	171600
3425	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570106AA	NB 01.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	105	Metres		2790	292950
3426	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570108AA	NB 01.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	10	Metres		3120	31200
3427	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570109AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	300	Metres		3400	1020000
3428	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570111AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	4040	Metres		4030	16281200
3429	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570113AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	2905	Metres		4600	13363000
3430	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570115AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	5275	Metres		5800	30595000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3431	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570115DA	NB 06.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	380	Metres		6650	2527000
3432	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570116AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	440	Metres		6940	3053600
3433	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570116DA	NB 08.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	4810	Metres		7840	37710400
3434	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570117AA	NB 10.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	5510	Metres		8150	44906500
3435	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570117DA	NB 10.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	125	Metres		9100	1137500
3436	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570118AA	NB 12.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	510	Metres		9290	4737900
3437	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570118DA	NB 12.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	1980	Metres		10290	20374200
3438	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570119DA	NB 14.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	200	Metres		11030	2206000
3439	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570121AA	NB 18.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	610	Metres		12260	7478600
3440	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570124AA	NB 24.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	410	Metres		15680	6428800
3441	B	B957-999-16-43-PK-SOR-9501-B-3M	M82057020000	FLANGE ASSEMBLIES					
3442	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570208AA	NB 01.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	2	NOs		3120	6240
3443	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570209AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	12	NOs		3400	40800
3444	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570211AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	39	NOs		4030	157170
3445	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570215AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	13	NOs		5800	75400
3446	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570217DA	NB 10.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	1	NOs		9100	9100
3447	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570218AA	NB 12.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	3	NOs		9290	27870
3448	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570218DA	NB 12.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	1	NOs		10290	10290
3449	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570219DA	NB 14.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	2	NOs		11030	22060
3450	B	B957-999-16-43-PK-SOR-9501-B-3M	M82057030000	BLIND FLANGE ASSEMBLIES					
3451	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570305AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	84	NOs		2640	221760
3452	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570306AA	NB 01.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	35	NOs		2790	97650
3453	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570309AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	2	NOs		3400	6800
3454	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570311AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	3	NOs		4030	12090
3455	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570313AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	9	NOs		4600	41400
3456	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570315AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	2	NOs		5800	11600
3457	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570315DA	NB 06.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	9	NOs		6650	59850
3458	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570316AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	2	NOs		6940	13880
3459	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570316DA	NB 08.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	3	NOs		7840	23520
3460	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570317AA	NB 10.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	3	NOs		8150	24450
3461	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570318AA	NB 12.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	6	NOs		9290	55740
3462	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570318DA	NB 12.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	1	NOs		10290	10290
3463	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570319DA	NB 14.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	5	NOs		11030	55150
3464	B	B957-999-16-43-PK-SOR-9501-B-3M	M82057040000	VALVE ASSEMBLIES					
3465	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570404AA	NB 00.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	7	NOs		5030	35210
3466	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570405AA	NB 00.75 INCHES; THK(I) 25 MM; THK(O) 25 MM	121	NOs		5280	638880
3467	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570406AA	NB 01.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	95	NOs		5580	530100
3468	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570409AA	NB 02.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	51	NOs		6790	346290
3469	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570411AA	NB 03.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	29	NOs		8060	233740
3470	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570413AA	NB 04.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	22	NOs		9200	202400
3471	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570415AA	NB 06.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	30	NOs		11610	348300
3472	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570415DA	NB 06.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	25	NOs		13310	332750
3473	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570416AA	NB 08.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	12	NOs		13880	166560
3474	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570416DA	NB 08.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	9	NOs		15680	141120
3475	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570417AA	NB 10.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	13	NOs		16300	211900
3476	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570417DA	NB 10.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	1	NOs		18200	18200
3477	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570418AA	NB 12.00 INCHES; THK(I) 25 MM; THK(O) 25 MM	6	NOs		18570	111420
3478	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570418DA	NB 12.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	9	NOs		20590	185310
3479	B	B957-999-16-43-PK-SOR-9501-B-3M	M820570419DA	NB 14.00 INCHES; THK(I) 40 MM; THK(O) 25 MM	5	NOs		22060	110300
3480	B	B957-999-16-43-PK-SOR-9501-B-3M	M82200000000	INSULATION MATERIAL : ROCKWOOL+PIC					
3481	B	B957-999-16-43-PK-SOR-9501-B-3M	M82257000000	INSULATION TYPE : IE; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO 175 (DEG C)					
3482	B	B957-999-16-43-PK-SOR-9501-B-3M	M82257010000	PIPES					
3483	B	B957-999-16-43-PK-SOR-9501-B-3M	M822570104AA	NB 0.50 INCHES; THK(I) 25 MM; THK(O) 25 MM	290	Metres		2510	727900

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3484	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0000000000	COLD INSULATION (OFFSITES) Providing thermal insulation including supply of all insulating and ancillary materials, Aluminium foil for SS surfaces, vapour barrier, weather protective coverings, consumables and other necessary materials , testing of materials as required , including transportation of materials to work site, duly inspected by 3rd party inspector(Llyods/BV/DNV or any other Client approved party) at manufacturer's shop & sample check/inspection at site by EIL Construction inspector, applying insulation on surfaces as specified including all preparatory works there on, binding, tying, lacing, stitching and/or otherwise securing , finishing with cladding as per spec., providing bolts, rivets, and self tapping screws wherever specified , providing inspection windows, end seals for flanges etc., colour coding and identification. Providing steel scaffolding, all tools , tackles , equipments etc. , labour, supervision and completing the work in all respect, at all heights as per drawings , specifications and instructions of Engineer-in-charge. (Refer Legend for applicable EIL specification)					
3485	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0700000000	INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
3486	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765000000	INSULATION TYPE : IC; SURFACE MATERIAL : CS & AS; OPERATING TEMP. RANGE : UPTO -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
3487	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010000	PIPES					
3488	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010410	NB 00.50 INCHES; THICKNESS 50 MM	10	Metres		2750	27500
3489	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010505	NB 00.75 INCHES; THICKNESS 25 MM	10	Metres		1720	17200
3490	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010513	NB 00.75 INCHES; THICKNESS 65 MM	10	Metres		3650	36500
3491	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010605	NB 01.00 INCHES; THICKNESS 25 MM	55	Metres		1880	103400
3492	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010613	NB 01.00 INCHES; THICKNESS 65 MM	20	Metres		3820	76400
3493	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010805	NB 01.50 INCHES; THICKNESS 25 MM	10	Metres		2170	21700
3494	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765010813	NB 01.50 INCHES; THICKNESS 65 MM	10	Metres		4200	42000
3495	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765011518	NB 06.00 INCHES; THICKNESS 90 MM	55	Metres		9620	529100
3496	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765011620	NB 08.00 INCHES; THICKNESS 100 MM	2800	Metres		11990	33572000
3497	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765011708	NB 10.00 INCHES; THICKNESS 40 MM	30	Metres		8210	246300
3498	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765011808	NB 12.00 INCHES; THICKNESS 40 MM	185	Metres		9410	1740850
3499	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765011823	NB 12.00 INCHES; THICKNESS 115 MM	645	Metres		16690	10765050
3500	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765020000	FLANGE ASSEMBLIES					
3501	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765020605	NB 01.00 INCHES; THICKNESS 25 MM	1	NOs		1830	1830
3502	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765020613	NB 01.00 INCHES; THICKNESS 65 MM	2	NOs		3820	7640
3503	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765020805	NB 01.50 INCHES; THICKNESS 25 MM	3	NOs		2170	6510
3504	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765020813	NB 01.50 INCHES; THICKNESS 65 MM	1	NOs		4200	4200
3505	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765021518	NB 06.00 INCHES; THICKNESS 90 MM	1	NOs		8820	8820
3506	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765021620	NB 08.00 INCHES; THICKNESS 100 MM	2	NOs		10880	21760
3507	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765021808	NB 12.00 INCHES; THICKNESS 40 MM	3	NOs		9410	28230
3508	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765021823	NB 12.00 INCHES; THICKNESS 115 MM	1	NOs		14960	14960
3509	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765030000	BLIND FLANGE ASSEMBLIES					
3510	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765030505	NB 00.75 INCHES; THICKNESS 25 MM	10	NOs		1720	17200
3511	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765030513	NB 00.75 INCHES; THICKNESS 65 MM	17	NOs		3650	62050
3512	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765031620	NB 08.00 INCHES; THICKNESS 100 MM	3	NOs		10880	32640
3513	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765031808	NB 12.00 INCHES; THICKNESS 40 MM	2	NOs		9410	18820
3514	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040000	VALVE ASSEMBLIES					
3515	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040410	NB 00.50 INCHES; THICKNESS 50 MM	5	NOs		5500	27500
3516	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040505	NB 00.75 INCHES; THICKNESS 25 MM	14	NOs		3440	48160
3517	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040513	NB 00.75 INCHES; THICKNESS 65 MM	23	NOs		7300	167900
3518	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040605	NB 01.00 INCHES; THICKNESS 25 MM	1	NOs		3760	3760
3519	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765040613	NB 01.00 INCHES; THICKNESS 65 MM	10	NOs		7630	76300
3520	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765041518	NB 06.00 INCHES; THICKNESS 90 MM	7	NOs		17630	123410
3521	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765041620	NB 08.00 INCHES; THICKNESS 100 MM	12	NOs		21760	261120
3522	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765041708	NB 10.00 INCHES; THICKNESS 40 MM	3	NOs		16420	49260
3523	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0765041808	NB 12.00 INCHES; THICKNESS 40 MM	6	NOs		18830	112980
3524	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768000000	INSULATION TYPE : IC; SURFACE MATERIAL : SS; OPERATING TEMP. RANGE : UPTO -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
3525	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768010000	PIPES					
3526	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768010513	NB 00.75 INCHES; THICKNESS 65 MM	10	Metres		3740	37400
3527	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768010613	NB 01.00 INCHES; THICKNESS 65 MM	10	Metres		3910	39100
3528	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768010813	NB 01.50 INCHES; THICKNESS 65 MM	10	Metres		4310	43100
3529	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768011310	NB 04.00 INCHES; THICKNESS 50 MM	20	Metres		5150	103000
3530	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768011510	NB 06.00 INCHES; THICKNESS 50 MM	675	Metres		6790	4583250

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3531	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768011518	NB 06.00 INCHES; THICKNESS 90 MM	640	Metres		9820	6284800
3532	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768011620	NB 08.00 INCHES; THICKNESS 100 MM	10	Metres		13540	135400
3533	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768011823	NB 12.00 INCHES; THICKNESS 115 MM	30	Metres		15290	458700
3534	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768020000	FLANGE ASSEMBLIES					
3535	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768020613	NB 01.00 INCHES; THICKNESS 65 MM	1	NOs		3910	3910
3536	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768020813	NB 01.50 INCHES; THICKNESS 65 MM	1	NOs		4310	4310
3537	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768021620	NB 08.00 INCHES; THICKNESS 100 MM	1	NOs		11140	11140
3538	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768030000	BLIND FLANGE ASSEMBLIES					
3539	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768030513	NB 00.75 INCHES; THICKNESS 65 MM	3	NOs		3740	11220
3540	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768031823	NB 12.00 INCHES; THICKNESS 115 MM	1	NOs		15290	15290
3541	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768040000	VALVE ASSEMBLIES					
3542	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768040513	NB 00.75 INCHES; THICKNESS 65 MM	3	NOs		7480	22440
3543	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768040613	NB 01.00 INCHES; THICKNESS 65 MM	1	NOs		7830	7830
3544	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768041310	NB 04.00 INCHES; THICKNESS 50 MM	3	NOs		10290	30870
3545	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768041518	NB 06.00 INCHES; THICKNESS 90 MM	2	NOs		18040	36080
3546	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768041620	NB 08.00 INCHES; THICKNESS 100 MM	1	NOs		27080	27080
3547	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0768041823	NB 12.00 INCHES; THICKNESS 115 MM	2	NOs		30590	61180
3548	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769000000	INSULATION TYPE : IC; SURFACE MATERIAL : SS; OPERATING TEMP. RANGE : BELOW -45 (DEG C); INSULATION MATERIAL : POLYURETHANE FOAM(PUF)					
3549	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769010000	PIPES					
3550	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769010615	NB 01.00 INCHES; THICKNESS 75 MM	10	Metres		4740	47400
3551	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769011530	NB 06.00 INCHES; THICKNESS 150 MM	210	Metres		14890	3126900
3552	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769020000	FLANGE ASSEMBLIES					
3553	B	B957-999-16-43-PK-SOR-9501-B-3M	MB0769020615	NB 01.00 INCHES; THICKNESS 75 MM	1	NOs		4460	4460
3554	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE	ELECTRICAL WORKS					
3555	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MB04	FLAME PROOF MOV DISTRIBUTION BOARD (FLP MOV DB)					
3556	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MB04.01	Supply of flameproof (Ex-d) and weather proof type 12 way MOV DB along with 2 nos. control junction box for gas group IIA/ IIB, T3, 415V, TPN, free standing floor mounting type/pedestal mounted type, dust and vermin proof with canopy suitable for outdoor installation including supply of FLP double compression brass nickel plated cable glands, lugs including all labour and materials, as per approved drawings, specifications 6-51-0007 and data sheets of this tender and directions of Engineer-in-Charge. FLP MOV DB shall have 2 nos. incomers, 415 V, 125A, TPN, 50 kA (1 sec), heavy duty switch and mechanical (castle key) interlock between incomer, voltmeter with selector Switches and ammeter with selector switches for each incomers with phase indication lamp. MCCB at incomer shall have 4-pole. 12 nos. 415V TP outgoing feeders each rated 32A with switch fuse unit with phase indication lamp.	2	nos		843570	1687140
3557	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MB07	HV PANEL EXTENSION Supply, installation, testing and commissioning of new indoor drawout type HV Panel as EXTENSION PANEL of existing 6.6kV HV switchboard of main bus bar rating 630A, 40kA for 1 sec, including interconnection of shipping section and requisite inter panel wiring between shipping sections, including supply of all new bus bars, new numerical relay, new CTs, new 630A vacuum circuit breaker, interfacing with existing Substation Automation System (SAS) & ECS including all cabling & connections & requisite modifications in existing SAS/ECS, installation on foundations or steel structures, aligning, levelling grouting, as per EIL Specification 6-51-0001, including any other modifications in the existing HV Switchboard to meet the Tender requirements etc. including all labour and materials, approved drawings, specifications of this tender, and directions of Engineer-in-Charge. Services of OEM (M/s SIEMENS) shall be availed.					
3558	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MB07.01	630A, Plant Feeder as per hardware datasheet no. B957-000-16-50-DS-0124 including feeder differential relay. Feeder differential relay (87F) shall include both sending end as well as receiving end units. Receiving end unit shall be free issued by Contractor for installation by others in their downstream switchboards.	2	nos		432600	865200
3559	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG08	ELECTRIC HEAT TRACING SYSTEM					
3560	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG08.01	Design, Engineering and supply including procurement services all equipment / materials for Electrical Heat tracing system (other than those pertaining to civil & structure, insulation painting and mechanical, Instrumentation works pertaining to site installation of equipment/ material) including heater tape, tracers, junction boxes, RTDs, central monitoring system, power distribution board (PDB), Local distribution panel (LDP), etc., complete earthing system, cabling system comprising of supply of all incoming and outgoing power and control cables of PDB and LDP i.e. all power and control cables from owner's substation to PDB/ LDP, PDB to LDP, PDBs/ LDPs to tracers/RTDs, communication cable from controllers to central monitoring system, multi circuit temperature controller, junction boxes, T-connectors, heating tape, tracer, communication cables (as required), necessary connectors, all materials including supply of MS Supports, GI Earthing Strips, earthing items, sands, bricks etc. and associated GI cable trays/ RCC trenches for electrical traced lines/ equipment under BPREP Project BPCL-Bina Refinery, including commissioning spares, special tools & tackles and consumables required for completing and establishing a fully functional and operative electrical Heat Tracing System and associated facilities including all other activities incidental to procurement and supply, complete as per scope of work/ supplies detailed in various section of bidding document, drawings, specifications including EIL specification 6-51-0095, Scope of supply & work and Job Specification and other provision of bidding document and directions of Engineer-In-Charge.	1	Lumpsum		199652625	199652625

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3561	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG08.02	Construction, fabrication, installation, testing, mechanical completion, pre commissioning, commissioning required for completing and establishing a fully functional and operative electrical heat tracing system and associated facilities for electrical traced lines/ equipment including any balance field engineering under BPREP Project BPCL-Bina Refinery. Supply of all materials required for completion of the job (excluding those covered under supply portion in item no. 01EE.MG08.01), inclusive of earthing works, RCC cable trenches, cable trays, all cable laying, connection & termination of all power & control cables from owner's substation to PDB/ LDP, PDB to LDP, PDB/LDP to tracers/RTDs, communication cables for fault alarms and communication cable from LDP to central monitoring system as defined in the tender, testing of multi circuit temperature controller, testing, labour, tools & tackles, consumables, transportation of materials from contractor's warehouse to work site, providing construction and all other activities, including civil works such as concrete foundations, excavation, disposal of surplus earth, levelling, grouting/ welding, bolting, riveting etc. as required complete in all respects as per bidding document, drawings, specifications, Scope of supply & work and Job Specification and direction of Engineer-In-Charge.	1	Lumpsum		66550875	66550875
3562	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG09	Supply, installation, testing and commissioning of following 415 V, 3 Phase, TPN, 50Hz, outdoor, weather proof, fixed type smart feeder pillars with feeder controller for controlling street lighting poles and hybrid solar street light poles, hardware required for connection with smart lighting control system, complete with canopy for additional weather protection, including supply and fixing of all required cable glands & lugs, including termination of cables, including construction of foundation, including transportation from store/yard to site at the place of installation, proper storage, assembly, installation, aligning, levelling, testing, calibration of meters, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. 100A Feeder Pillar with (100A incomer MCCB - 1 NOS, 63A outgoing MCCB - 5 NOS) Note: RCCB with 30mA rating shall be provided in all outgoing feeders. Incomer shall be provided with voltmeter, ammeter with selector switches, contactor and synchronous timer. All MCCB shall be with shunt trip coil and shall be microprocessor based with O/L, S/C & E/F protection.	1	nos		678770	678770
3563	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MB10	Supply, installation, testing and commissioning of following 415 V, 3 Phase, TPN, 50Hz, outdoor, weather proof, fixed type feeder pillars (Incomer shall have voltmeter and ammeter with selector switches) complete with canopy for additional weather protection, including supply and fixing of all required cable glands & lugs, including termination of cables, including construction of foundation, including transportation from store/yard to site at the place of installation, proper storage, assembly, installation, aligning, levelling, testing, calibration of meters, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. 160A Feeder Pillar with (160A incomer MCCB - 1 NOS, 63A outgoing MCCB - 5 NOS) Note: RCCB with 30mA rating shall be provided in all outgoing feeders. Incomer shall be provided with contactor and synchronous timer. All MCCB shall be with shunt trip coil and shall be microprocessor based with O/L, S/C & E/F protection	3	nos		565470	1696410
3564	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG11	NIFPS: Installation, testing and commissioning of complete NIFPS system excluding the construction of foundation, including laying and termination of cables, pipe fittings, valves, flanges etc. for NIFPS system, transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, including connection of auxiliary circuits, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3565	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG11.01	33/6.9 kV, 20/25 MVA transformers	2	nos		463500	927000
3566	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG17	Deployment of skilled manpower (As per requirement indicated in the attached job specification) for carrying out various activities associated to Electrical works as per direction of Engineer-in -charge.	1	Man month		41200	41200
3567	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MG18	Deployment of un-skilled manpower (As per requirement indicated in the attached job specification) for carrying out various activities associated to Electrical works as per direction of Engineer-in -charge	1	Man month		30900	30900
3568	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010	TRANSFORMERS					
3569	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.30	Installation of transformers of the following ratings excluding the construction of foundation, including transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, including connection of auxiliary circuits, topping up with oil and testing of oil with contractor's own test equipment, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3570	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.30.MC02	2 Winding ONAN/ONAF outdoor transformer with OLTC. 33 kV/6.9 kV 20/25 MVA	2	nos		322905	645810
3571	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.30.20V1	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 2.5 MV·A	6	nos		32847	197082
3572	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.30.20V6	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 1.25 MV·A	1	nos		30148	30148
3573	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.30.20V8	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 3.15 MV·A	2	nos		41488	82976
3574	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.40	Filtration of transformer oil by stream line filter machine provided by the contractor for improving the insulation strength of oil to the required strength, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge. (Excluding the supply of oil).					
3575	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.40.10	Filtration of transformer oil with dissolved gas analysis test.	10600	Litre		32	339200
3576	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.40.20	Filtration of transformer oil without dissolved gas analysis test.	25000	Litre		22	550000
3577	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.50	Supply of transformer oil conforming to IS-335 in non-returnable 220 litre drums for topping up various transformers. The oil shall be tested prior to filling up and improved by filtering, if required, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge.					
3578	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.50.10	No. of Drums.	2	nos		31291	62582
3579	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.60	Supply of dry type transformers with accessories, including nuts and bolts etc., as per EIL standard specification No. 6-51-0042, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3580	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.60.10V1	2 Winding Dry type transformers. .415 kV / .415 kV 150 kV·A	8	nos		810569	6484552

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3581	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.60.10V2	2 Winding Dry type transformers. .415 kV / .415 kV 250 kV·A	2	nos		1179515	2359030
3582	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.60.10V15	2 Winding Dry type transformers. .415 kV / .415 kV 75 kV·A	6	nos		717776	4306656
3583	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.70	Installation, testing and commissioning of dry transformer of following rating, including transportation from store/yard to site at the place of installation, unpacking, positioning in place, site assembly of loosely furnished accessories, connection of auxiliary circuits, including fixing of nuts and bolts etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3584	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.70.10V1	2 Winding Dry type transformers. .415 kV / .415 kV 150 kV·A	8	nos		19014	152112
3585	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.70.10V2	2 Winding Dry type transformers. .415 kV / .415 kV 250 kV·A	2	nos		23659	47318
3586	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.70.10V16	2 Winding Dry type transformers. .415 kV / .415 kV 75 kV·A	6	nos		43466	260796
3587	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.110	Testing and commissioning of transformers of the following rating including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
3588	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.110.MC02	2 Winding ONAN/ONAF outdoor transformer with OLTC. 33 kV / 6.9 kV, 20/25 MVA	2	nos		322905	645810
3589	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.110.20V1	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 2.5 MV·A	6	nos		27017	162102
3590	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.110.20V9	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 1.25 MV·A	1	nos		13359	13359
3591	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1010.110.20V11	2 Winding ONAN outdoor transformer with off circuit tap changer. 6.6 kV / .433 kV 3.15 MV·A	2	nos		32785	65570
3592	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020	SWITCHBOARDS / UPS / VSD / BATTERY CHARGERS / PANELS					
3593	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MG1	Design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing, delivery to site including all labour and materials along with supply of special tools & tackles for following Fixed type PDB as per 6-51-0012 with 415 V, 3 Phase, TPN, 50Hz Incomer and 415V 3 phase TPN outgoing feeders as mentioned below, complete with documentations as per approved drawings, specifications, data sheets and other codes & standards attached or referred with this tender and directions of Engineer-incharge.					
3594	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MG1.01	415V fixed type PDB, rated 400A, 50 kA (for 1 sec), MCCB incomer and 3 Phase TPN outgoing feeders as per attached feeder list (B957-000-16-50-DS-9946)	1	nos		5479497	5479497
3595	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MG1.02	415V fixed type PDB, rated 400A, 50 kA (for 1 sec), MCCB incomer and 3 Phase TPN outgoing feeders as per attached feeder list (B957-000-16-50-DS-9947)	1	nos		4586487	4586487
3596	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MG1.03	415V fixed type PDB, rated 125A, 50 kA (for 1 sec), MCCB incomer and 3 Phase TPN outgoing feeders as per attached feeder list (B957-000-16-50-DS-9948)	1	nos		4101460	4101460
3597	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.30	Installation, testing and commissioning of bus ducts of following ratings between transformer secondary and the switchgear incomer panel, including transportation from store/yard to site at the place of installation, unpacking, making connections and installation of bends, breaking of walls and making good of the same etc., (but excluding structural supports), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3598	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.30.10V3	Air Insulated/segregated bus ducts 415 V 4000 A 65 kA for 1 second	90	m		7560	680400
3599	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.30.10V8	Air Insulated/segregated bus ducts 6600 V 2500 A 40 kA for 1 second	30	m		5408	162240
3600	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.30.10V15	Air Insulated/segregated bus ducts 415 V 5000 A 65 kA for 1 second	30	m		9177	275310
3601	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.30.10V16	Air Insulated/segregated bus ducts 415 V 2000 A 65 kA for 1 second	15	m		3790	56850
3602	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MB30	Installation, testing and commissioning of 6.6kV Switchgear External gas ducts (for release of gases due to internal arc) between 6.6 KV switchboard and 6.6kV isolation breaker panel, 6.6 KV switchboard/6.6kV isolation breaker panel and switchgear wall (as per the switchboard Vendor drawings), including transportation from store/yard to site at the place of installation, unpacking, making connections and installation of bends, breaking of walls and making good of the same etc., (but excluding structural supports), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Work involves removal of existing false ceiling if required as per site requirement for providing structural supports for gas duct and reinstalling false ceiling.					
3603	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.MB30.01	Gas duct	50	m		41200	2060000
3604	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.100	Installation, testing and commissioning of following indoor fixed type switch boards in non-drawout, including transportation from store/yard to site at the place of installation, proper storage, assembly of sections, installation on concrete trenches/foundation, mounting and wiring of loose accessories supplied by equipment vendor etc., aligning, levelling, testing, calibration of meters/relays and all other accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3605	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.100.MG01	Fixed type MV switchboards. 415 V 400 A 50 kA for 1 second as per item No. 01EE.1020.MG1.01	1	nos		273980	273980
3606	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.100.MG02	Fixed type MV switchboards. 415 V 400 A 50 kA for 1 second as per item No. 01EE.1020.MG1.02	1	nos		229381	229381
3607	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.100.10V10	Fixed type MV switchboards. 415 V 125 A 50 kA for 1 second	1	nos		205073	205073
3608	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200	Installation, testing and commissioning of switch-boards, relay and control panels, annunciation panels, UPS system, battery chargers, distribution boards, cubicles with electrical equipment, VSD panels, misc .electrical panels etc., including transportation from store/yard to site at the place of installation, lifting the panels by deployment of tyre mounted hydraulic trollies, unpacking, assembly, including mounting and wiring of loose parts supplied by equipment vendor, interconnection of shipping sections and requisite inter-panel wiring between shipping sections, including supply of all wiring materials, installation on foundations or fixing to wall or steel structures, aligning, levelling, grouting, testing and calibration of relays and meters etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3609	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.10	Weight of the Unit upto 100 kg	5	nos		4007	20035
3610	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.20	Weight of the Unit from 101 upto 500 kg.	10	nos		6592	65920
3611	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.30	Weight of the Unit from 501 upto 1000 kg.	30	nos		8539	256170
3612	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.40	Weight of the Unit from 1001 upto 1500 kg.	150	nos		10485	1572750

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3613	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.50	Weight of the Unit from 1501 upto 3000 kg.	100	nos		15780	1578000
3614	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.200.60	Weight of the Unit from 3001 upto 5000 kg.	5	nos		26255	131275
3615	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210	Installation of switch-boards, relay and control panels, annunciation panels, UPS system, battery chargers, distribution boards, cubicles with electrical equipment, VSD panels, misc .electrical panels etc., including transportation from store/yard to site at the place of installation, lifting the panels by deployment of tyre mounted hydraulic trollies, unpacking, assembly, including mounting and wiring of loose parts supplied by equipment vendor, interconnection of shipping sections and requisite inter-panel wiring between shipping sections, including supply of all wiring materials, installation on foundations or fixing to wall or steel structures, aligning, levelling, grouting, testing and calibration of relays and meters etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3616	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.10	Weight of the Unit upto 100 kg	10	nos		2709	27090
3617	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.20	Weight of the Unit from 101 upto 500 kg.	20	nos		5953	119060
3618	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.30	Weight of the Unit from 501 upto 1000 kg.	50	nos		7890	394500
3619	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.40	Weight of the Unit from 1001 upto 1500 kg.	5	nos		9826	49130
3620	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.50	Weight of the Unit from 1501 upto 3000 kg.	2	nos		15120	30240
3621	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.210.60	Weight of the Unit from 3001 upto 5000 kg.	1	nos		45917	45917
3622	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.250	Design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing, delivery to site including all labour and materials along with supply of special tools & tackles for following Fixed type PDB as per 6-51-0012 with 415 V, 3 Phase, TPN, 50Hz Incomer and 240V single phase outgoing feeders as mentioned below, complete with documentations as per approved drawings, specifications, data sheets and other codes & standards attached or referred with this tender and directions of Engineer-in-charge.					
3623	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1020.250.MC01	415V fixed type PDB rated for (Bus Fault Rating - 50 KA (1 Sec), No. of Incomers - 2Nos, Incomer MCCB rating - 200 Amps, Outgoing Double Pole MCB of 16 Amps - 60 Nos (out of which 15 nos. feeders shall be provided with ammeter), Outgoing Double Pole MCB of 32 Amps - 20 Nos, Outgoing Double Pole MCB of 63 Amps - 10 Nos) INCOMER SHALL BE MECHANICALLY INTERLOCKED	3	nos		398095	1194285
3624	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040	MISCELLANEOUS CONTROL GEAR					
3625	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.10	Installation, testing and commissioning of miscellaneous surface mounted industrial/FLP control gear such as lighting/power panel, push button stations, motor starter, communication equipment, junction boxes, panels, plugs, sockets, including supply of necessary hardware, touch up painting including supply of paint, including transportation from store/yard to site at the place of installation, unpacking, (excluding fixing of cable glands and cable terminations), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3626	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.10.10	Weight of the unit up to 5 kg.	10	nos		865	8650
3627	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.10.20	Weight of the unit above 5 kg. but upto 20 kg.	65	nos		2122	137930
3628	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.10.30	Weight of the unit above 20 kg. but upto 100 kg.	10	nos		4079	40790
3629	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.20	Supply of Industrial, weather proof type Push Button stations as per EIL specification No. 6-51-0014, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3630	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.20.50	With start,stop push buttons, one Three position selector switch and ammeter.	5	nos		7076	35380
3631	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.20.MB60	with stop push button (break glass type) and Indicating lamps for ON / OFF	15	nos		9898	148470
3632	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30	Supply of flameproof and weather proof type Push Button station as per EIL standard specification No. 6-51-0006 as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3633	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC01	With Stop push button Gas Group IIA/IIB, Temp Class T3	1	nos		5408	5408
3634	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC02	With Stop push buttons Gas Group IIC, Temp Class T3	1	nos		5408	5408
3635	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC05	With Start, Stop push buttons and ammeter Gas Group IIA/IIB, Temp Class T3	1	nos		10094	10094
3636	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC06	With Start, Stop push buttons and ammeter Gas Group IIC, Temp Class T3	1	nos		10094	10094
3637	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC09	With Start, Stop push buttons, One Three Position selector Switch and Ammeter Gas Group IIA/IIB, Temp Class T3	1	nos		13740	13740
3638	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.30.MC10	With Start, Stop push buttons, One Three Position selector Switch and Ammeter Gas Group IIC, Temp Class T3	1	nos		13740	13740
3639	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.40	Supply of weatherproof 415V, 3 phase, 50 Hz, AC DOL starters of the following ratings with suitable switchfuse, contactor, thermal relay , On/Off indicating lamps including double compression brass nickel plated cable glands, tinned copper lugs, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3640	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1040.40.10	Upto 5.5 kW.	2	nos		19735	39470
3641	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050	DC SYSTEM / BATTERY BANK					
3642	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60	Installation of stationary nickel-cadmium battery banks of the following ratings, including transportation from store/yard to site at the place of installation, filling with electrolyte, aligning, levelling, grouting, assembly of battery racks, fixing of inter-cell connectors etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3643	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V36	Nickel-cadmium battery banks rated for 110 V 150 Ah	2	nos		21620	43240
3644	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V71	Nickel-cadmium battery banks rated for 110 V 590 Ah	2	nos		70421	140842
3645	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V74	Nickel-cadmium battery banks rated for 110 V 390 Ah	2	nos		41200	82400
3646	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V75	Nickel-cadmium battery banks rated for 110 V 360 Ah	2	nos		41200	82400
3647	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V76	Nickel-cadmium battery banks rated for 110 V 330 Ah	2	nos		41200	82400
3648	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V77	Nickel-cadmium battery banks rated for 384 V 865 Ah	2	nos		93493	186986

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3649	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V78	Nickel-cadmium battery banks rated for 384 V 180 Ah	2	nos		77250	154500
3650	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1050.60.10V79	Nickel-cadmium battery banks rated for 228 V 280 Ah	4	nos		82400	329600
3651	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060	PLUGS, SOCKETS AND JUNCTION BOXES					
3652	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10	Supply of weatherproof metal clad 415V, TPN, industrial type socket and plug with heavy duty interlocking switch, with adequately sized cable adaptor box for incoming and outgoing cable terminations, including supply of double compression brass nickel plated cable glands, tinned copper lugs, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3653	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.10	63 A, 415 V, 5 pin sockets.	5	nos		16212	81060
3654	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.40	63 A, 415 V, 5 pin sockets along with associated 5 pin plugs.	65	nos		22670	1473550
3655	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.80	240 V, 15 A, 3 pin sockets along with associated 3 pin plugs.	30	nos		4305	129150
3656	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.90	24 V, 5 A, 3 pin socket WITH TRANSFORMER.(240/24V)	5	nos		2338	11690
3657	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.100	24 V, 5 A, 3 pin sockets along with associated 3 pin plugs. WITH TRANSFORMER.(240/24V)	5	nos		2802	14010
3658	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.10.110	24 V, 60 W, handlamps.	5	nos		4645	23225
3659	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20	Supply of following types of FLP(II A/II B) and WP sockets, plugs and handlamps as per EIL specification No. 6-51-0021, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3660	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.10	63 A, 415 V, 5 pin socket.	5	nos		23247	116235
3661	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.20	63 A, 415 V, 5 pin Plugs for item no. 01EE.1060.20.10	5	nos		8219	41095
3662	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.30	63A, 415V, 4 pin socket.	5	nos		17108	85540
3663	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.40	63 A, 415 V, 4 pin plugs for item no. 01EE.1060.20.30	5	nos		5717	28585
3664	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.70	240 V, 15 A, 3 pin socket.	5	nos		6510	32550
3665	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.20.70	5	nos		3842	19210
3666	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.90	24 V, 5 A, 3 pin socket WITH TRANSFORMER.(240/24V)	5	nos		2668	13340
3667	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.100	24 V, 5 A, 3 pin sockets along with associated 3 pin plugs. WITH TRANSFORMER.(240/24V)	5	nos		3317	16585
3668	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.20.110	24 V, 60 W, handlamps.	5	nos		5552	27760
3669	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30	Supply of following types of FLP (II C) and WP sockets, plugs and handlamps as per EIL specification No. 6-51-0021, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3670	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.10	63 A, 415 V, 5 pin socket.	5	nos		27089	135445
3671	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.20	63 A, 415 V, 5 pin Plugs for item no. 01EE.1060.30.10	5	nos		9455	47275
3672	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.70	240 V, 15 A, 3 pin socket.	5	nos		5727	28635
3673	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.30.70	5	nos		3368	16840
3674	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.90	24 V, 5 A, 3 pin socket.	5	nos		3955	19775
3675	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.100	24 V, 5 A, 3 pin Plugs for item no. 01EE.1060.30.90	5	nos		3224	16120
3676	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.30.110	24 V, 60 W, handlamps.	5	nos		5408	27040
3677	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.40	Supply, installation, cable termination, connection, testing and commissioning of following types of FLP and WP junction boxes, as per EIL specification No. 6-51-0061, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3678	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.40.10	FLP (IIA/IIB) and WP JB with 15 A, 16 terminals suitable for 1 No. incoming and 6 Nos. outgoing cable entries complete with FLP cable glands for incoming and outgoing cables and 3 Nos. blocking plugs.	5	nos		9919	49595
3679	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.40.20	FLP (IIA/IIB) and WP JB with 15 A, 16 terminals suitable for 1 No. incoming and 12 Nos. outgoing cable entries complete with FLP cable glands for incoming and outgoing cables and 4 Nos. blocking plugs.	5	nos		9919	49595
3680	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.40.30	FLP(II A/II B) and WP 3 way JB complete with 3 Nos. FLP cable glands and 1 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	5	nos		13339	66695
3681	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.40.40	FLP(II A/II B) and WP 4 way JB complete with 4 Nos. FLP cable glands and 2 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	5	nos		18447	92235
3682	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.50	Supply, installation, cable termination, connection, testing and commissioning of following types of FLP and WP junction boxes, suitable for gas group IIA/IIB, temperature class T3, as per EIL specification No. 6-51-0061, including suitably sized busbars with current rating equal to the largest cable current rating, glands, lugs, earthing terminals, canopy etc, including all labours and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3683	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.50.10V5	Suitable for 415V system with 2 Run(s) of 3 core 185 mm² incoming cable(s) and 1 Run(s) of 3 core 120 mm² outgoing cable(s)	1	nos		22403	22403
3684	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.50.10V10	Suitable for 415V system with 2 Run(s) of 3 core 150 mm² incoming cable(s) and 1 Run(s) of 3 core 95 mm² outgoing cable(s)	1	nos		21064	21064
3685	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1060.50.10V12	Suitable for 415V system with 3 Run(s) of 3 core 185 mm² incoming cable(s) and 1 Run(s) of 3 core 240 mm² outgoing cable(s)	1	nos		39789	39789
3686	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1070	NEUTRAL GROUNDING RESISTOR					
3687	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1070.10	Supply of following rating of outdoor type neutral grounding resistor, as per EIL standard specification no.6-51-0043, including all labour and materials, as per approved drawings, specifications of this tnder and directions of Engineer-in-Charge.					
3688	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1070.10.10V2	NGR rated for 3.81 kV 600 A	2	nos		314593	629186
3689	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1070.20	Installation, testing and commissioning of outdoor type following neutral grounding resistor consisting of cast iron/stainless steel grid resistor with/without neutral CT including connection of one end of resistor with transformer neutral and the other end of the resistor to the earthing grid, including transportation from store/yard to site at the place of installation, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3690	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1070.20.10V1	NGR rated for 3.81 kV 600 A	2	nos		16181	32362

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3691	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1080	CAPACITOR BANKS					
3692	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1080.20	Installation of following H.V. capacitor banks, series reactor and RVT, including transportation from store/yard to site of installation, unpacking, assembly of elevating structure, interconnection of loose parts supplied by equipment vendor, aligning, levelling etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3693	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1080.20.10V2	HV capacitor banks rated for 1200 kVAR 6.6 kV	2	nos		70380	140760
3694	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090	CANOPIES					
3695	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.10	Supply, fabrication and installation of canopies for miscellaneous outdoor equipment like motors, fire alarm points, telephones, communication hand set stations etc. to render them weatherproof made out of 1.6 mm (16 gauge) sheet steel including supply of hardware and paint, painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	50	kg		350	17500
3696	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20	Supply, fabrication and installation of FRP canopies for outdoor electrical motors of following frame sizes to render them weather proof including supply of necessary hardware for fixing and clamping with the motor foundation, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3697	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.10	Frame size upto 80.	2	nos		2987	5974
3698	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.20	Frame size more than 80 and upto 112.	2	nos		3523	7046
3699	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.30	Frame size more than 112 and upto 180.	2	nos		6942	13884
3700	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.40	Frame size more than 180 and upto 250.	2	nos		11526	23052
3701	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.50	Frame size more than 250 and upto 315.	2	nos		23041	46082
3702	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.60	Frame size more than 315 and upto 450.	2	nos		27089	54178
3703	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.70	Frame size more than 450 and upto 630.	2	nos		45969	91938
3704	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.20.80	Frame size more than 630.	2	nos		86170	172340
3705	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.30	Supply, fabrication and installation of FRP canopies for outdoor electrical miscellaneous equipments such as lighting/power panels and distribution junction boxes, local panels , PB stations etc. to render them weather proof including supply of necessary hardware for fixing and clamping with the equipment, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3706	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.30.10	Lighting Panel/Power panel/distribution junctions boxes.	5	nos		4594	22970
3707	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.30.20	Manual call points/field call stations.	5	nos		4594	22970
3708	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.30.30	Push button stations.	5	nos		4594	22970
3709	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1090.30.40	FLP receptacles.	5	nos		4594	22970
3710	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100	ANCHOR FASTENERS					
3711	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10	Supply, drilling in RCC and fixing of metallic anchor fasteners for supporting of cable trays and miscellaneous electrical switchgear of following sizes, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3712	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.10	3/16" BSW.	200	nos		138	27600
3713	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.20	5/16" BSW.	200	nos		148	29600
3714	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.30	1/4" BSW.	200	nos		148	29600
3715	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.40	3/8" BSW.	1000	nos		180	180000
3716	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.50	5/8" BSW.	2000	nos		212	424000
3717	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1100.10.60	1/2" BSW.	1500	nos		201	301500
3718	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110	TESTING AND COMMISSIONING OF MOTORS					
3719	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10	Testing and commissioning of MV motors of following ratings and checking of all interface connections, change of grease, wherever required, including supply of approved type of grease, no load/full load running of motor, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3720	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.10	Upto 5.5 kW.	10	nos		2060	20600
3721	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.20	Above 5.5 kW but upto 11 kW.	10	nos		2709	27090
3722	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.30	Above 11 kW but upto 22 kW.	10	nos		4007	40070
3723	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.40	Above 22 kW but upto 45 kW.	10	nos		4645	46450
3724	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.50	Above 45 kW but upto 75 kW.	10	nos		7241	72410
3725	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.60	Above 75 kW but upto 125 kW.	5	nos		9826	49130
3726	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.10.MB70	Above 125 kW but upto 132 kW	2	nos		13256	26512
3727	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.20	Testing and commissioning of HV motors of following ratings and checking of all interface connections, change of grease in bearings, wherever required, including supply of approved type of grease, no load/full load running of motor, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
3728	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.20.10	Above 132 kW but upto 400 kW.	2	nos		17026	34052
3729	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.20.20	Above 400 kW but upto 800 kW.	5	nos		18344	91720
3730	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.30	Testing and commissioning of safe area/ FLP motor operated valve actuators with integral starter of different sizes, checking of all interface connections, local/remote controls, settings of limit and torque switches, no load/full load running, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
3731	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.30.10	Safe area/FLP motor operated valve actuators.	50	nos		3935	196750

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3732	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.40	Testing and commissioning of 415V, TPN, Lube Oil Heaters of following ratings, checking of all interface connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in- Charge					
3733	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.40.10	Upto 5.5 kW	5	nos		1627	8135
3734	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.40.20	Above 5.5 kW and upto 11 kW	5	nos		2163	10815
3735	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.40.30	Above 11 kW and upto 22kW	5	nos		3245	16225
3736	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.40.MC01	Above 22 kW	2	nos		4378	8756
3737	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.50	Testing and commissioning of 240V, SPN, Lube Oil Heaters of following ratings, checking of all interface connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in- Charge					
3738	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1110.50.10	Upto 5.5 kW	2	nos		1627	3254
3739	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130	SAFETY EQUIPMENT					
3740	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10	Supply and installation of the following, including the supply of necessary clamps, bolts, rawl plugs etc., breaking and making good of walls, if required, mounting, including all labour and materials, complete and as per applicable standards and CEA Guidelines and as per directions of Engineer-in-Charge.					
3741	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.20	First Aid Boxes.	5	nos		3100	15500
3742	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.60	Sand buckets with stand (Each with at least 3 sand buckets).	20	nos		4491	89820
3743	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MB70	Artificial respirator	3	nos		2060	6180
3744	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.80	Shock hazard charts - Laminated type	20	nos		1689	33780
3745	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.90	Gas Mask for use in substation during fire & smoke as per CEA guidelines	3	nos		7787	23361
3746	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MA01	Wall mounted Illuminated type Electrical Single Line Diagrams-A0 size" for the unit including frame, power supply hardware, LED fittings, sockets, glass, etc.	5	nos		15450	77250
3747	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MC02	True RMS Digital Multimeter with Display of up to 3 digits of decimal.	3	nos		5150	15450
3748	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MC03	Clamp on earth meggar	3	nos		5150	15450
3749	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MC06	HV tester & HV Tapes	3	nos		5150	15450
3750	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.10.MB100	LOTO system facility (Box, lock & Key, HASP, Wire etc.)	3	nos		10300	30900
3751	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.20	Supply and laying of 900 mm wide safety insulation mats complying to IS-15652, of following grades required for maintenance of electrical equipment in substation, including cutting to required shape in running length, including all labour and materials, as per applicable Indian or International standards and CEA Guidelines and as per directions of Engineer-in-Charge.					
3752	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.20.10	3.3 kV grade.	100	m		2884	288400
3753	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.20.20	11 kV grade.	10	m		3451	34510
3754	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.20.30	33 kV grade.	10	m		4017	40170
3755	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30	Supply of following items as per applicable Indian standards/CEA Guidelines.					
3756	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.10	Rubber hand gloves (11 kV grade).	6	pair		3461	20766
3757	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.20	Rubber hand gloves (33 kV grade).	6	pair		5057	30342
3758	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.30	Enamelled caution boards.	6	nos		1308	7848
3759	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.40	Discharge rod with earthing facility (upto 11 kV grade).	6	nos		12803	76818
3760	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.50	Discharge rod with earthing facility (Above11 kV & 33kV).	6	nos		19199	115194
3761	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.30.70	HV fuse puller handle.	6	nos		927	5562
3762	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.40	Supply and application/installation of epoxy based insulation coating with breakdown voltage as per IS, suitable for system voltage as marked and shall be suitable for installation on concrete flooring of substation in airconditioned/non-airconditioned area, having smooth finish, including all labour and materials, complete as per approved drawings, job & standard specification attached with this tender and directions of the engineer-in-charge					
3763	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1130.40.40	For highest systen voltage of 7.2kV	1500	m²		2287	3430500
3764	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140	SUPPLY OF SPARES / LAMPS					
3765	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20	MV HRC Fuses					
3766	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.10	16 A.	5	nos		128	640
3767	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.20	32 A.	5	nos		179	895
3768	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.30	63 A.	5	nos		253	1265
3769	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.40	100 A.	5	nos		444	2220
3770	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.50	160 A.	5	nos		729	3645
3771	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.60	250 A.	5	nos		867	4335
3772	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.70	315 A.	5	nos		920	4600
3773	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.20.80	400 A.	5	nos		1036	5180
3774	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.30	LAMPS					
3775	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.30.MC01	LED Lamp (4000-4500 LUMENS, 100 LM/Watt) for well glass Ltg. fixtures	5	nos		5150	25750
3776	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.30.MC02	LED Lamp (6500-7000 LUMENS, 100 LM/Watt) for well glass Ltg. fixtures.	5	nos		7210	36050
3777	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.30.MC03	LED Lamp (6500-7000 LUMENS, 100 LM/Watt) for flood Ltg. fixtures	5	nos		10300	51500
3778	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1140.30.MC04	LED Lamp (10000-10500 LUMENS, 100 LM/Watt) for flood Ltg. fixtures	5	nos		15450	77250

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3779	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1150	CCOE APPROVAL					
3780	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.1150.10	Obtaining approval from CCoE(Chief Controller of Explosives)for imported equipment such as motors, local control panels, junction boxes & misc. equipment, etc. based on the type test certificates made available from the equipment/sub vendor supplier including submission of application to statutory authorities, necessary fee, all test certificates, equipment drawings in required volume, interaction with the authority, perusal of approval and obtaining necessary approval certificate before the energisation of equipment as per specification of this tender and direction of Engineer in charge.	1	nos		161792	161792
3781	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010	SUPPLY OF MV CABLES					
3782	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.30	Supply of 1100 V grade, Copper Conductor,XLPE insulated and armoured, cables of following sizes as per EIL standard specification No. 6-51-0051, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
3783	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.30.20	3 C x 2.5 sq. mm	2000	m		113	226000
3784	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.30.30	4 C x 2.5 sq. mm	2000	m		134	268000
3785	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.50	Supply of 1100 V grade, Aluminium Conductor, XLPE insulated and armoured, cables of following sizes as per EIL standard specification No. 6-51-0051, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
3786	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.50.270	3.5 C x 70 sq. mm	1000	m		319	319000
3787	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.50.380	3.5 C x 185 sq. mm	500	m		783	391500
3788	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.60	Supply of 1100 V grade, Copper Conductor, Individual pair shielded & Overall shielded, twisted pair/triad, XLPE insulated, Armored, FRLS outer-sheathed cables of following sizes as per EIL standard specification No. 6-51-0052, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
3789	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.60.110	2 Pair x 2.5 sq. mm	1000	m		196	196000
3790	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.60.130	4 Pair x 2.5 sq. mm	1000	m		330	330000
3791	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.60.140	6 Pair x 2.5 sq. mm	1000	m		474	474000
3792	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2010.60.170	12 Pair x 2.5 sq. mm	1000	m		876	876000
3793	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040	LAYING OF CABLES					
3794	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10	Laying of cables of different voltage grade and types of the following overall diameters in ready trays/trenches/ supported on structure/pull through pipes including supply and fixing of stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles & saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
3795	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.01	Cables with OD upto 20 mm.	40000	m		31	1240000
3796	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.02	Cables with OD above 20 mm but upto 30 mm.	50000	m		41	2050000
3797	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.03	Cables with OD above 30 mm but upto 40 mm.	20000	m		52	1040000
3798	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.04	Cables with OD above 40 mm but upto 50 mm.	10000	m		72	720000
3799	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.05	Cables with OD above 50 mm but upto 60 mm.	5000	m		93	465000
3800	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.06	Cables with OD above 60 mm but upto 80 mm.	20000	m		113	2260000
3801	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA10.07	Cables with OD above 80 mm but upto 100 mm.	1000	m		144	144000
3802	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20	Laying of cables(using cable pulling by motorized winch with torque limits) of different voltage grade and types of the following overall diameters in ready trays/trenches/ supported on structure/pull through pipes including supply and fixing of stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles & saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
3803	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.01	Cables with OD upto 20 mm.	10000	m		41	410000
3804	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.02	Cables with OD above 20 mm but upto 30 mm.	15000	m		52	780000
3805	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.03	Cables with OD above 30 mm but upto 40 mm.	5000	m		72	360000
3806	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.04	Cables with OD above 40 mm but upto 50 mm.	3000	m		82	246000
3807	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.05	Cables with OD above 50 mm but upto 60 mm.	1000	m		103	103000
3808	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.06	Cables with OD above 60 mm but upto 80 mm.	5000	m		113	565000
3809	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MA20.07	Cables with OD above 80 mm but upto 100 mm.	500	m		175	87500
3810	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB50	Laying of XLPE insulated, armoured cables of following sizes in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
3811	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB50.01	6.6kV, 1C x 630 sq. mm, Aluminum Conductor	60000	m		412	24720000
3812	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB50.02	33kV, 1C x 630 sq. mm, Aluminum Conductor	9000	m		464	4176000

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3813	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB60	Laying of XLPE insulated, Armoured cables of following sizes (using cable pulling by motorized winch with torque limits) in trefoil formation by bracing using clamps at intervals not exceeding 2 meters and binding with tapes in line with IS (Indian Standards), in ready trays/ trenches/ supported on structure/pull through pipes including supply, installation and fixing of bracing clamps for trefoil formation, binding tapes, stainless steel strip number tags, supply and applying of fireproofing paint to meet OISD requirement (for 1m length near terminations), supply and fixing of GI saddles and saddle bars etc., including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Cable quantity mentioned is for 1 Run of single core cable)					
3814	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB60.01	6.6kV, 1C x 630 sq. mm, Aluminum Conductor	24000	m		433	10392000
3815	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2040.MB60.02	33kV, 1C x 630 sq. mm, Aluminum Conductor	4000	m		484	1936000
3816	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050	END TERMINATIONS					
3817	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.50	Supply of Earthed grade H.V. termination kits of (indoor/outdoor type) as per EIL standard specification No. 6-51-0051, excluding cable glands and lugs, as per approved drawings and as per specifications of this tender and directions of Engineer-in-Charge.					
3818	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.50.20V4	1 Core cable Indoor termination kit for 33 kV 630 mm²	30	nos		12401	372030
3819	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60	Supply of Unearthed grade H.V. termination kits of (indoor/outdoor type) as per EIL standard specification No. 6-51-0051, excluding cable glands and lugs, as per approved drawings and as per specifications of this tender and directions of Engineer-in-Charge.					
3820	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60.10V1	3 Core cable Indoor termination kit for 6.6 kV 300 mm²	30	nos		9074	272220
3821	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60.10V3	3 Core cable Indoor termination kit for 6.6 kV 240 mm²	5	nos		8621	43105
3822	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60.20V3	1 Core cable Indoor termination kit for 6.6 kV 630 mm²	100	nos		6808	680800
3823	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60.30V2	3 Core cable Outdoor termination kit for 6.6 kV 240 mm²	2	nos		10784	21568
3824	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.60.30V3	3 Core cable Outdoor termination kit for 6.6 kV 300 mm²	10	nos		12401	124010
3825	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.70	Termination of Earthed grade HV cables and connection of leads including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug onto the conductor, restoration of the insulation, clamping of cable cores and earthing of armour, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excluding supply of termination kits and cable glands).					
3826	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.70.20V4	1 Core cable termination kit for 33 kV 630 mm²	30	nos		5408	162240
3827	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.80	Termination of Unearthed grade HV cables and connection of leads including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug onto the conductor, restoration of the insulation, clamping of cable cores and earthing of armour, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excluding supply of termination kits and cable glands).					
3828	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.80.10V1	3 Core cable termination kit for 6.6 kV 300 mm²	40	nos		6489	259560
3829	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.80.10V2	3 Core cable termination kit for 6.6 kV 240 mm²	10	nos		6242	62420
3830	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.80.20V2	1 Core cable termination kit for 6.6 kV 630 mm²	100	nos		5408	540800
3831	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100	Termination of XLPE insulated armoured power cables (up to 1100 V grade) and connection of leads excluding the supply of cable glands and lugs but including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting and stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable-cores, marking with wire number, ferrules etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3832	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.10	Cables with OD upto 20 mm.	500	nos		227	113500
3833	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.20	Cables with OD above 20 mm but upto 30 mm.	250	nos		330	82500
3834	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.30	Cables with OD above 30 mm but upto 40 mm.	300	nos		402	120600
3835	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.40	Cables with OD above 40 mm but upto 50 mm.	200	nos		577	115400
3836	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.50	Cables with OD above 50 mm but upto 60 mm.	300	nos		731	219300
3837	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		1082	10820
3838	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.100.70	Cables with OD above 80 mm but upto 100 mm.	2	nos		1349	2698
3839	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.110	Termination of communication, fire alarm & control paired cables and connection of leads excluding the supply of cable glands and lugs but including fixing of cable glands, supply and fixing of PVC shrouds for outdoor terminations, cutting, stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable- cores, marking with wire number, ferrules etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3840	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.110.40	All sizes from 1P to 4P and upto 2.5 sq. mm	500	nos		340	170000
3841	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.110.50	All sizes from 5P to 10P and upto 2.5 sq. mm	200	nos		402	80400
3842	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.110.60	All sizes from 11P to 15P and upto 2.5 sq. mm	200	nos		577	115400
3843	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2050.120	Fire proofing of cables including supply of all fire proofing paint, including all labour and materials, as per IEC-60331, specifications of this tender and directions of Engineer-in- Charge. (Actual area of surface painted shall be measured).	80	m²		1957	156560
3844	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060	STRAIGHT THROUGH JOINTS					
3845	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10	Supply and Making of heat shrinkable type straight through joints for 1100 volt grade power cables as per EIL standard specification No. 6-51-0051, including cutting, stripping of cable insulation complete with supply of compression / crimping type ferrules, plastic mould and epoxy resin compound etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3846	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.10	Cables with OD upto 20 mm.	5	nos		2215	11075
3847	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.20	Cables with OD above 20 mm but upto 30 mm.	5	nos		4058	20290

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3848	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.30	Cables with OD above 30 mm but upto 40 mm.	5	nos		5799	28995
3849	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.40	Cables with OD above 40 mm but upto 50 mm.	5	nos		8333	41665
3850	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.50	Cables with OD above 50 mm but upto 60 mm.	5	nos		10424	52120
3851	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.10.60	Cables with OD above 60 mm but upto 80 mm.	5	nos		14461	72305
3852	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.30	Supply of heat shrinkable type Straight through jointing kits for Unearthed grade H.V. cables of the following sizes, as per EIL standard specification No. 6-51-0051, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3853	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.30.10V1	3 Core cable Straight through jointing kits for 6.6 kV 300 mm²	20	nos		23968	479360
3854	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.30.10V2	3 Core cable Straight through jointing kits for 6.6 kV 240 mm²	2	nos		22670	45340
3855	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.30.20V1	1 Core cable Straight through jointing kits for 6.6 kV 630 mm²	2	nos		18138	36276
3856	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.40	Making of Straight through joints for H.V. cables of following sizes excluding supply of jointing kit and accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3857	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.40.10V1	3 Core cable Straight through jointing kits for 6.6 kV 300 mm²	20	nos		5830	116600
3858	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.40.10V2	3 Core cable Straight through jointing kits for 6.6 kV 240 mm²	2	nos		5335	10670
3859	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.40.20V3	1 Core cable Straight through jointing kits for 6.6 kV 630 mm²	2	nos		3409	6818
3860	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.130	Supply and Making of heat shrinkable type straight through joints for communication, fire alarm & control paired cables, including cutting, stripping of cable insulation complete with supply of compression / crimping type ferrules, plastic mould and epoxy resin compound etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3861	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.130.40	All sizes from 1P to 4P and upto 2.5 sq. mm	5	nos		2256	11280
3862	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.130.50	All sizes from 5P to 10P and upto 2.5 sq. mm	5	nos		3420	17100
3863	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2060.130.60	All sizes from 11P to 15P and upto 2.5 sq. mm	5	nos		4882	24410
3864	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070	G.I. & PVC PIPES					
3865	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.10	Supply and laying of following sizes of G.I. Pipes (medium) in required length fixed on steel, concrete or similar structure, laid in trenches, ready to be buried in concrete including cutting, threading, bending and similar works, supply of clamps, small iron structures, spacers and installation of seats, plugs, bushings etc., small civil works, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3866	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.10.20	50 mm NB.	250	m		1030	257500
3867	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.10.50	100 mm NB.	250	m		2915	728750
3868	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.10.70	150 mm NB.	250	m		4965	1241250
3869	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.20	Supply and laying of following sizes of PVC Pipes in required length fixed on steel, concrete or similar structure, laid in trenches, ready to be buried in concrete including cutting, threading, supply of bends and similar works, supply of clamps, small iron structures, spacers and installation of seats, plugs, bushings etc., small civil works, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3870	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.20.20	50 mm NB.	50	m		227	11350
3871	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.20.50	100 mm NB.	50	m		824	41200
3872	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2070.20.70	150 mm NB.	50	m		1895	94750
3873	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080	STRUCTURAL STEEL					
3874	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA01	Supply, fabrication and installation of MS base frames, supports for switchgear, and brackets for miscellaneous electrical equipments, cable and cable tray supports out of rolled MS sections, pipes, plates etc. including shot blasting, welding, bolting, riveting, supply of necessary anchor bolts and grouting etc., supply of paint and applying of anti-rust primer coat and finished coats of approved synthetic enamel paint (as per painting Specification attached with tender) suitable for highly corrosive environment, including breaking walls, floors etc. for structures as required including supply of all GI hardware materials, all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Any item weighing up to 1kg. or less shall neither be measured nor paid).	2500	Kg		124	310000
3875	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA02	Supply and installation of push button station supports complete with base plate, foundations bolts, grouting and painting as per Specification for surface preparation and protective coating, B269-000 -02-42-PCS-0001 suitable for highly corrosive environment etc., including all labour and materials, as per approved drawings and directions of Engineer-in-Charge.					
3876	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA02.01	As per std. 7-51-0306	60	nos		20600	1236000
3877	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA02.02	As per std. 7-51-0307	5	nos		20600	103000
3878	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA02.03	As per std. 7-51-0308	5	nos		20600	103000
3879	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2080.MA02.04	As per std. 7-51-0317	5	nos		20600	103000
3880	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090	CABLE - TRAYS					
3881	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10	Supply and installation of prefabricated hot dip galvanised steel cable trays, fabricated out of hot rolled sheet steel with rigid welded construction ladder type with a rung as per std. 7-51-0333, of approved make and cable tray fittings, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3882	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.MB01	Horizontal bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5804	1363940
3883	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.MB02	Vertical outside bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5413	1272055
3884	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.MB03	Vertical inside bends for 750 mm wide tray with 1600 mm bending radius.	235	nos		5721	1344435
3885	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.MB04	Tee Joints for 750 mm wide tray with 1600 mm bending radius.	15	nos		8197	122955

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3886	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.MB05	Cross Joints for 750 mm wide tray with 1600 mm bending radius.	30	nos		6953	208590
3887	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.10	300 mm wide Straight run cable tray.	2000	m		1535	3070000
3888	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.20	450 mm wide Straight run cable tray.	400	m		1648	659200
3889	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.40	750 mm wide Straight run cable tray.	50000	m		1885	94250000
3890	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.450	Reducers 750 - 450 RHS.	5	nos		4707	23535
3891	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.460	Reducers 750 - 450 LHS.	5	nos		4707	23535
3892	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.470	Reducers 750 - 300 RHS.	5	nos		4305	21525
3893	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.480	Reducers 750 - 300 LHS.	5	nos		4305	21525
3894	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.490	Reducers 450 - 300 RHS.	5	nos		4027	20135
3895	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.500	Reducers 450 - 300 LHS.	5	nos		4027	20135
3896	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.510	Reducers 600 - 450 RHS.	5	nos		4305	21525
3897	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.520	Reducers 600 - 450 LHS.	5	nos		4305	21525
3898	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.530	Reducers 600 - 300 RHS.	5	nos		4027	20135
3899	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.540	Reducers 600 - 300 LHS.	5	nos		4027	20135
3900	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.550	Reducers 750 - 600 RHS.	5	nos		5047	25235
3901	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.560	Reducers 750 - 600 LHS.	5	nos		5047	25235
3902	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.570	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	40	nos		3636	145440
3903	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.580	Horizontal bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
3904	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.600	Horizontal bends for 750 mm wide tray with 1000 mm bending radius.	240	nos		5047	1211280
3905	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.610	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius	70	nos		3770	263900
3906	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.620	Vertical outside bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
3907	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.640	Vertical outside bends for 750 mm wide tray with 1000 mm bending radius.	235	nos		5047	1186045
3908	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.650	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius	10	nos		3636	36360
3909	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.660	Vertical inside bends for 450 mm wide tray with 1000 mm bending radius.	10	nos		4172	41720
3910	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.680	Vertical inside bends for 750 mm wide tray with 1000 mm bending radius.	165	nos		5047	832755
3911	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.690	Tee Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		5232	26160
3912	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.700	Tee Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		6046	30230
3913	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.720	Tee Joints for 750 mm wide tray with 1000 mm bending radius.	35	nos		7128	249480
3914	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.730	Cross Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		4707	23535
3915	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.740	Cross Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		5047	25235
3916	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.10.760	Cross Joints for 750 mm wide tray with 1000 mm bending radius.	15	nos		6046	90690
3917	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.30	Supply and installation of following galvanised slotted channel trays of 2 mm thickness and 50 mm high for supporting cables, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3918	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.30.10	100 mm wide.	3050	m		597	1820850
3919	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.30.20	150 mm wide.	350	m		793	277550
3920	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.30.30	60 mm wide.	160	m		340	54400
3921	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.40	Supply, fabrication and installation of 0.91 mm (20 gauge) GI sheet covers for cable trays, including necessary hardwares, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	15000	m²		1813	27195000
3922	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50	Supply and installation of prefabricated ladder type Fibre reinforced plastic(FRP) cable trays of approved make with a rung and cable tray fittings similar to trays as per std.7-51-0333, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge					
3923	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.10	300 mm wide Straight run cable tray.	60	m		1349	80940
3924	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.20	450 mm wide Straight run cable tray.	60	m		1483	88980
3925	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.40	750 mm wide Straight run cable tray.	500	m		1978	989000
3926	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.50	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
3927	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.60	Horizontal bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
3928	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.70	Horizontal bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
3929	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.80	Horizontal bends for 750 mm wide tray with 1000 mm bending radius.	5	nos		6046	30230
3930	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.90	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
3931	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.100	Vertical outside bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
3932	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.110	Vertical outside bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
3933	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.120	Vertical outside bends for 750 mm wide tray with 1000 mm bending radius.	5	nos		6056	30280
3934	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.130	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius.	5	nos		4717	23585
3935	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.140	Vertical inside bends for 450 mm wide tray with 1000 mm bending radius.	5	nos		5057	25285
3936	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.150	Vertical inside bends for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
3937	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.160	Vertical inside bends for 750 mm wide tray with 1000 mm bending radius.	5	nos		6046	30230

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
3938	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.170	Tee Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
3939	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.180	Tee Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		5593	27965
3940	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.190	Tee Joints for 600 mm wide tray with 1000 mm bending radius.	5	nos		5861	29305
3941	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.200	Tee Joints for 750 mm wide tray with 1000 mm bending radius.	5	nos		6056	30280
3942	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.210	Cross Joints for 300 mm wide tray with 1000 mm bending radius.	5	nos		4316	21580
3943	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.220	Cross Joints for 450 mm wide tray with 1000 mm bending radius.	5	nos		4707	23535
3944	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.230	Cross Joints for 600 mm wide tray with 1000 mm bending radius.	5	nos		5387	26935
3945	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.240	Cross Joints for 750 mm wide tray with 1000 mm bending radius.	5	nos		5644	28220
3946	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.250	Reducers 750 - 450 RHS	5	nos		4316	21580
3947	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.260	Reducers 750 - 450 LHS	5	nos		4316	21580
3948	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.270	Reducers 750 - 300 RHS	5	nos		4450	22250
3949	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.280	Reducers 750 - 300 LHS	5	nos		4450	22250
3950	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.290	Reducers 450 - 300 RHS	5	nos		4573	22865
3951	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.300	Reducers 450 - 300 LHS	5	nos		4573	22865
3952	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.310	Reducers 600 - 450 RHS	5	nos		4707	23535
3953	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.320	Reducers 600 - 450 LHS	5	nos		4707	23535
3954	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.330	Reducers 600 - 300 RHS	5	nos		4027	20135
3955	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.340	Reducers 600 - 300 LHS	5	nos		4027	20135
3956	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.350	Reducers 750 - 600 RHS	5	nos		4717	23585
3957	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2090.50.360	Reducers 750 - 600 LHS	5	nos		4707	23535
3958	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100	CABLE GLANDS					
3959	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10	Supply of nickel-plated, flame proof IIA/IIB double compression type brass cable glands, suitable for out door terminations of armoured PVC cables of following overall diameter (excluding termination and connection of cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3960	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.10	Cables with OD upto 20 mm.	10	nos		381	3810
3961	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		680	6800
3962	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		1092	10920
3963	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1906	19060
3964	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2173	21730
3965	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		2925	29250
3966	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.10.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
3967	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20	Supply of nickel-plated, flame proof IIC double compression type brass cable glands, suitable for out door terminations of armoured PVC cables of following overall diameter (excluding termination and connection of cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3968	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.10	Cables with OD upto 20 mm.	10	nos		494	4940
3969	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		556	5560
3970	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		1257	12570
3971	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1782	17820
3972	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2709	27090
3973	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		3255	32550
3974	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.20.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
3975	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30	Supply of nickel plated brass double compression cable glands suitable for outdoor installations (WP) of following overall diameter (excluding termination and connections of cables), including drilling of suitable holes in equipments for fixing purposes etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3976	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.10	Cables with OD upto 20 mm.	10	nos		330	3300
3977	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.20	Cables with OD above 20 mm but upto 30 mm.	10	nos		556	5560
3978	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.30	Cables with OD above 30 mm but upto 40 mm.	10	nos		927	9270
3979	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.40	Cables with OD above 40 mm but upto 50 mm.	10	nos		1463	14630
3980	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.50	Cables with OD above 50 mm but upto 60 mm.	10	nos		2173	21730
3981	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.60	Cables with OD above 60 mm but upto 80 mm.	10	nos		3255	32550
3982	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.30.70	Cables with OD above 80 mm but upto 100 mm.	10	nos		3790	37900
3983	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40	Supply of nickel plated brass single compression cable glands of following overall diameter (excluding termination and connections of cables), including drilling of suitable holes in equipments for fixing purposes etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3984	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.10	Cables with OD upto 20 mm.	5	nos		180	900
3985	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.20	Cables with OD above 20 mm but upto 30 mm.	5	nos		299	1495
3986	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.30	Cables with OD above 30 mm but upto 40 mm.	5	nos		556	2780

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3987	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.40	Cables with OD above 40 mm but upto 50 mm.	5	nos		690	3450
3988	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.50	Cables with OD above 50 mm but upto 60 mm.	5	nos		1009	5045
3989	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.60	Cables with OD above 60 mm but upto 80 mm.	5	nos		1803	9015
3990	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.40.70	Cables with OD above 80 mm but upto 100 mm.	5	nos		2400	12000
3991	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50	Supply and fixing of FLP(IIA/IIB) blocking plugs for blocking unused cable entries with following diameter in outdoor electrical equipment including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
3992	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.10	Cables with OD up to 20 mm	5	nos		371	1855
3993	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.20	Cables with OD above 20 mm but upto 30 mm	5	nos		536	2680
3994	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.30	Cables with OD above 30 mm but upto 40 mm	5	nos		711	3555
3995	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.40	Cables with OD above 40 mm but upto 50 mm	5	nos		968	4840
3996	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.50	Cables with OD above 50 mm but upto 60 mm	5	nos		1164	5820
3997	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.60	Cables with OD above 60 mm but upto 80 mm	5	nos		1514	7570
3998	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.50.70	Cables with OD above 80 mm but upto 100 mm	5	nos		1741	8705
3999	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60	Supply and fixing of FLP(IIC) blocking plugs for blocking unused cable entries with following diameter in outdoor electrical equipment including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4000	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.10	Cables with OD up to 20 mm	5	nos		556	2780
4001	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.20	Cables with OD above 20 mm but upto 30 mm	5	nos		546	2730
4002	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.30	Cables with OD above 30 mm but upto 40 mm	5	nos		711	3555
4003	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.40	Cables with OD above 40 mm but upto 50.0 mm	5	nos		999	4995
4004	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.50	Cables with OD above 50 mm but upto 60 mm	5	nos		1288	6440
4005	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.60	Cables with OD above 60 mm but upto 80 mm	5	nos		1463	7315
4006	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2100.60.70	Cables with OD above 80 mm but upto 100 mm	5	nos		1741	8705
4007	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2110	MARKERS					
4008	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2110.10	Supply and installation of cable markers as per std. 7-51-0301, for underground cable runs with 14 SWG enamelled steel plate with white lettering on jade green background inclusive of providing and fixing supports, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	100	nos		1741	174100
4009	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2110.30	Supply and installation of earth pit markers for directly buried GI pipe electrodes with 14 SWG enamelled steel plate engraved with white letters BURIED, EARTH ELECTRODE on JADE green background complete with support and foundation as per approved drawings, specifications of this tender and direction of Engineer-in-Charge.	200	nos		1741	348200
4010	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120	CABLE LUGS					
4011	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.10	Supply of crimping type long barrel tinned copper lugs with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4012	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.10.10	All sizes upto 10 sq. mm	10	nos		32	320
4013	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.10.20	All sizes from 16 to 35 sq. mm	10	nos		54	540
4014	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.10.30	All sizes from 50 to 185 sq. mm	10	nos		361	3610
4015	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.10.40	All sizes from 240 to 400 sq. mm	10	nos		896	8960
4016	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.20	Supply of crimping type long barrel aluminium lugs with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4017	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.20.10	All sizes upto 10 sq. mm	10	nos		22	220
4018	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.20.20	All sizes from 16 to 35 sq. mm	10	nos		32	320
4019	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.20.30	All sizes from 50 to 185 sq. mm	10	nos		148	1480
4020	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.20.40	All sizes from 240 to 400 sq. mm	10	nos		201	2010
4021	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.30	Supply of crimping type long barrel Bimetallic lugs with Al barrel & tinned Cu palm with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4022	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.30.10	All sizes upto 10 sq. mm	10	nos		32	320
4023	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.30.20	All sizes from 16 to 35 sq. mm	10	nos		43	430
4024	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.30.30	All sizes from 50 to 185 sq. mm	10	nos		278	2780
4025	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.30.40	All sizes from 240 to 400 sq. mm	10	nos		556	5560
4026	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.40	Supply of crimping type long barrel Bimetallic lugs with tinned Cu barrel & Al palm with circular/sector shaped barrel for following conductor sizes, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4027	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.40.10	All sizes upto 10 sq. mm	10	nos		43	430
4028	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.40.20	All sizes from 16 to 35 sq. mm	10	nos		74	740
4029	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.40.30	All sizes from 50 to 185 sq. mm	10	nos		148	1480
4030	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2120.40.40	All sizes from 240 to 400 sq. mm	10	nos		201	2010
4031	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2130	INTERFACE BOX					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4032	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2130.10	Supply, installation, testing and commissioning of interface box made out of 2.03 mm (14 gauge) sheet steel, with one anti-rust coat of primer, with two finished coats of approved epoxy paint, with following No. of Clamp type terminals suitable for 2.5 sq. mm copper conductor with hinged lockable door, detachable gland plate at the bottom/top complete with termination and connections of incoming/ outgoing cables, including all labour and materials, as per specifications of this tender and directions of Engineer-in-Charge.					
4033	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2130.10.20	With 200 Terminals with overall dimensions 750 x 650 x 250 mm.	1	nos		36730	36730
4034	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2130.10.30	With 100 Terminals with overall dimensions 750 x 650 x 250 mm.	1	nos		22969	22969
4035	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2140	SEALING COMPOUND					
4036	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2140.10	Supply of sealing compound (Bituminous tar or approved equivalent) heating and pouring of compound in the cable stuffing box of flameproof motors and providing effective cable sealing, including all labour and materials, as per specifications of this tender and as per directions of Engineer-in-Charge (Measurement of weight shall be made for sealing compound supplied).	10	kg		1195	11950
4037	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160	ADAPTORS / REDUCERS / NIPPLES ETC.					
4038	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10	Supply and fixing nickel-plated brass adaptors/ reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
4039	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	10	nos		577	5770
4040	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.20	Eqpt. Thread 1" PF (J.I.S.) - E.T. Thread 3/4"ET	10	nos		577	5770
4041	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	10	nos		762	7620
4042	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	10	nos		886	8860
4043	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	10	nos		999	9990
4044	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.10.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	10	nos		1452	14520
4045	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30	Supply and fixing FLP(IIA/IIB), weatherproof, nickel-plated brass adaptors/reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
4046	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	10	nos		762	7620
4047	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.20	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 3/4"ET	10	nos		937	9370
4048	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	10	nos		937	9370
4049	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	10	nos		1391	13910
4050	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	10	nos		1494	14940
4051	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.30.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	10	nos		1679	16790
4052	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50	Supply and fixing FLP(IIC), weatherproof, nickel-plated brass adaptors/reducers for cable glands of following sizes including all labour and materials complete as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Adaptors shall have male part threaded as per Eqpt. threads and the other end to receive glands having E.T. thread.					
4053	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.10	Eqpt. Thread 3/4" PF (J.I.S.)-E.T. Thread 3/4"ET	5	nos		1483	7415
4054	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.20	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 3/4"ET	5	nos		1483	7415
4055	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.30	Eqpt. Thread 1" PF (J.I.S.) -E.T. Thread 1"ET	5	nos		1607	8035
4056	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.40	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/4"ET	5	nos		1854	9270
4057	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.50	Eqpt. Thread 1-1/2" PF (J.I.S.)- E.T. Thread 1-1/2"ET	5	nos		2081	10405
4058	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.2160.50.60	Eqpt. Thread 2" PF (J.I.S.) -E.T. Thread 1-1/2"ET	5	nos		2307	11535
4059	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3010	FLOOD LIGHT MASTS					
4060	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3010.20	Design, supply, installation, testing and commissioning of high mast lighting system as per EIL specification No. 6-51-0039, data sheet, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes and all other sundry materials, special cables etc. as required for each high masts, including fixing and connection of fixtures, cables, earthing, lightning rods and all mounting accessories and hardware as required, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4061	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3010.20.MB10	30M high flood light mast for Safe Area, complete with 24 Nos. 400W dimmable LED floodlight fixtures including dimmable drivers, smart dimming controller, smart high mast feeder pillar panel, weatherproof cable glands and lugs, and all associated cabling between drivers, controllers, and feeder pillar panel, suitable for outdoor installation and compliant with tender specifications	10	nos		1267291	12672910
4062	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3010.20.MB20	30M high flood light mast for Hazardous Area (Gas Group IIA/IIB, Temperature Class T3), complete with 24 Nos. 400W dimmable LED floodlight fixtures including dimmable drivers, smart dimming controller, smart high mast feeder pillar panel, weatherproof cable glands and lugs, and all associated cabling between drivers, controllers, and feeder pillar panel, suitable for outdoor installation and compliant with tender specifications.	2	nos		1522314	3044628
4063	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020	LIGHTING POLES					
4064	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.10	Supply and installation of street lighting poles (single bracket/double bracket) including supply and installation of marshalling box as per std. 7-51-0208 and necessary wire/cable running from marshalling box to the lighting fixture, cable termination and connection, fixing of cable glands and lugs, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4065	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.10.10	Poles as per std. 7-51-0207 sht. 1 of 2 (Single bracket).	5	nos		29087	145435
4066	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.10.20	Poles as per std. 7-51-0207 sht. 1 of 2 (Double bracket).	5	nos		34907	174535
4067	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.10.30	Poles as per std. 7-51-0207 sht. 2 of 2 (Single bracket).	5	nos		36658	183290
4068	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.10.40	Poles as per std. 7-51-0207 sht. 2 of 2 (Double bracket).	5	nos		40726	203630
4069	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.20	Supply and installation of Lighting Poles for floor mounting as per std. 7-51-0201, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, (excluding supply and installation of control gear box/junction box), but including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4070	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.20.10	Lighting poles including supply and connection of wires upto fixtures for safe areas.	5	nos		23268	116340
4071	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.20.20	Lighting poles for hazardous areas.	5	nos		22701	113505
4072	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.30	Supply and installation of platform Lighting pole as per std. 7-51-0202, including all welding, structural works, paint and all sundry materials as required, including painting, (excluding supply and installation of control gear box/junction box), but including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4073	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.30.10	Lighting poles including supply and connection of wires upto fixtures for safe areas.	55	nos		6994	384670
4074	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.30.20	Lighting poles for hazardous areas.	50	nos		8734	436700
4075	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.40	Supply and installation of Flood Light Poles as per std. 7-51-0205 (sheet 1 of 2) including supply and installation of marshalling box as per std. 7-51-0208, necessary wires running from marshalling box to the lighting fixtures, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4076	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.40.10	Flood light poles with marshalling box and wires for safe areas.	5	nos		37235	186175
4077	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.50	Supply and installation of Flood Light Pole (two) as per std. 7-51-0205 (sheet 2 of 2) (excluding the supply and installation of control gear box/ junction boxes), including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4078	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.50.10	Flood light poles for hazardous areas.	5	nos		46546	232730
4079	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70	Supply and installation of street lighting poles (single bracket/double bracket) including built in marshalling box and necessary wire/cable running from marshalling box to the lighting fixture, cable termination and connection, fixing of cable glands and lugs, including all civil works, excavation, foundation, disposal of surplus earth, providing shoring, strutting and dewatering if required and including supply of cement, steel, GI pipes, base plates, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4080	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.10	Poles as per std. 7-51-0233 with MB as per 7-51-0208 for safe area	5	nos		33887	169435
4081	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.20	Poles as per std. 7-51-0233 FLP MB for Gas IIA/IIB, Temp Class T3 for hazardous area	175	nos		26564	4648700
4082	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.30	Poles as per std. 7-51-0234 sht. 1 of 2 (Single bracket)	15	nos		24524	367860
4083	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.40	Poles as per std. 7-51-0234 sht. 1 of 2 (Double bracket)	15	nos		36575	548625
4084	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.50	Poles as per std. 7-51-0234 sht. 2 of 2 (Single bracket)	25	nos		39573	989325
4085	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.60	Poles as per std. 7-51-0234 sht. 2 of 2 (Double bracket)	25	nos		43621	1090525
4086	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.70	Poles as per std. 7-51-0235 sht. 1 of 2	25	nos		42343	1058575
4087	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.70.80	Poles as per std. 7-51-0235 sht. 2 of 2	15	nos		50872	763080
4088	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.80	Supply and installation of G.I. light pole for aviation lights including all civil works, structural steel works, foundation, providing shoring, strutting and de-watering as required and including supply of cement, steel, GI pipes, base plates, adaptors, reducers, paint and all sundry materials as required, including painting, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
4089	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.80.10	Poles as per std. 7-51-0220 Detail-1	5	nos		10702	53510
4090	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3020.80.20	Poles as per std. 7-51-0220 Detail-2	5	nos		9600	48000
4091	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030	HAZARDOUS AREA LIGHTING FIXTURES AND ACCESSORIES					
4092	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10	Installation, connection, testing and commissioning of following types of flame proof/Div.2 lighting fixtures and accessories, including cable termination and connection, fixing of cable glands, lugs, including supply of necessary hardwares, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4093	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.10	Well glass type pole mounting type for Ground Level.	80	nos		670	53600
4094	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.20	Well glass type pole mounting type for Platform.	230	nos		670	154100
4095	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.30	Well glass type bracket mounted.	20	nos		670	13400
4096	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.40	Well glass type ceiling mounted.	50	nos		670	33500
4097	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.50	Bulk head type, column/ceiling mounted.	20	nos		670	13400
4098	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.60	Flood light fixtures.	30	nos		1195	35850
4099	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.70	3-way, junction box.	75	nos		536	40200
4100	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.80	4-way, junction box.	5	nos		670	3350

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4101	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.10.100	FLP double obstruction aviation fixture.	5	nos		3935	19675
4102	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20	Supply of following FLP/Div.2 lighting fixtures complete with lamps, requisite FLP cable glands, plugs and necessary control gear as per EIL standard specification No. 6-51-0061, data sheet for lighting fixture schedule, including all albour and materials, specifications of this tender and directions of Engineer-in-Charge.					
4103	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MA01	Type FLP LED-1 Fixture IIA/IIB (60-65 W) & accessories complete with LED lamp.	2	nos		5150	10300
4104	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MA02	Type FLP LED-2 Fixture IIA/IIB (100-105 W) & accessories complete with LED lamp.	2	nos		5150	10300
4105	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MA03	Type FLP LED-3 Fixture IIA/IIB (150-155 W) & accessories complete with LED lamp.	2	nos		7210	14420
4106	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MA04	Type FLP LED-FD2 Fixture IIA/IIB (100-105 W) & accessories complete with LED lamp.	2	nos		7210	14420
4107	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC05	Type FLP LED-FD3 Fixture IIA/IIB (150-155 W) & accessories complete with LED lamp.	2	nos		9270	18540
4108	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC06	Type FLP LED-DC Fixture IIA/IIB (40-45 W) & accessories complete with LED lamp.	1	nos		5150	5150
4109	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC07	Type FLP LED-AV Fixture IIA/IIB & accessories complete with LED lamp.	1	nos		8240	8240
4110	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC08	Type FLP LED-1 Fixture IIC (60-65 W) & accessories complete with LED lamp.	1	nos		5150	5150
4111	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC09	Type FLP LED-2 Fixture IIC (100-105 W) & accessories complete with LED lamp.	1	nos		5150	5150
4112	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC10	Type FLP LED-3 Fixture IIC (150-155 W) & accessories complete with LED lamp.	1	nos		7210	7210
4113	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC11	Type FLP LED-FD2 Fixture IIC (100-105 W) & accessories complete with LED lamp.	1	nos		7210	7210
4114	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC12	Type FLP LED-FD3 Fixture IIC (150-155 W) & accessories complete with LED lamp.	1	nos		9270	9270
4115	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC13	Type FLP LED-DC Fixture IIC (40-45 W) & accessories complete with LED lamp.	1	nos		5150	5150
4116	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.20.MC14	Type FLP LED-AV Fixture IIC & accessories complete with LED lamp.	1	nos		8240	8240
4117	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.30	Supply and installation of Type-`A' clamps(for bracket mounted lighting fixtures) including bolt (MOC SS304) for fixing the fixture to the clamp as per EIL std.no.7-51-0221, including supply and fixing of anchor fasteners, nuts and bolts, washers etc. as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	15	nos		1009	15135
4118	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.40	Supply and installation of Type-`B' clamps(for ceiling mounted lighting fixtures) including bolt (MOC SS304) for fixing the fixture to the clamps per EIL std.no.7-51-0221, including supply and fixing of anchor fastners,nuts and bolts,washers as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	45	nos		1009	45405
4119	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3030.50	Supply and installation of adapters for Platform and ground pole mounted lighting fixtures as per EIL std.no.7-51-0221, approved drawings, specifications of this tender and directions of Engineer-in-Charge.	315	nos		690	217350
4120	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040	SAFE AREA LIGHTING FIXTURES					
4121	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20	Supply, installation, testing and commissioning of following energy efficient lighting fixtures and connecting to wiring junction box/marshalling box complete with lamps and necessary control gear including supply of all connected materials like flexible conduit, clamps, supports, chains, anchor fastners, bolts, nuts and washers etc. as required, including supply and fixing of cable glands, lugs, including all labour and materials, as per approved drawings, data sheet for lighting fixture schedule, EIL installation standards, specifications of this tender and directions of Engineer-in-Charge.					
4122	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.200	Type LED 1 Fixtures.	5	nos		6788	33940
4123	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.210	Type LED 2 Fixtures.	5	nos		6788	33940
4124	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.220	Type LED 3 Fixtures.	5	nos		2039	10195
4125	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.230	Type LED 4 Fixtures.	5	nos		3234	16170
4126	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.240	Type LED 5 Fixtures.	5	nos		7086	35430
4127	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.250	Type LED 6 Fixtures.	5	nos		2369	11845
4128	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.260	Type LED 7 Fixtures.	5	nos		2369	11845
4129	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.270	Type LED 8 Fixtures.	5	nos		1730	8650
4130	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.280	Type LED 9 Fixtures.	5	nos		10300	51500
4131	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.350	Type LED IND-1 Fixtures.	5	nos		886	4430
4132	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.360	Type LED IND-2 Fixtures.	5	nos		1092	5460
4133	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.370	Type LED IND-3 Fixtures.	5	nos		5840	29200
4134	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.380	Type LED IND-4 Fixtures.	5	nos		1092	5460
4135	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.450	Type LED RSD-10 Fixtures.	5	nos		2596	12980
4136	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.460	Type LED SFD-12 Fixtures.	5	nos		2596	12980
4137	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.470	Type LED LB-1 Fixtures.	5	nos		18921	94605
4138	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.480	Type LED HB-1 Fixtures.	5	nos		23669	118345
4139	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.490	Type LED HB-2 Fixtures.	5	nos		24751	123755
4140	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.500	Type LED BK-1 Fixtures.	5	nos		1504	7520
4141	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.510	Type LED BK-2 Fixtures.	5	nos		1864	9320
4142	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.520	Type LED BK-3 Fixtures.	5	nos		9692	48460
4143	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.530	Type LED BK-4 Fixtures.	60	nos		12360	741600
4144	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.550	Type LED ST-4 Fixtures.	5	nos		13009	65045
4145	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.560	Type LED ST-10 Fixtures.	5	nos		14502	72510
4146	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.MG560	Dimmable type LED ST-10 Fixture with analog dimmable driver along with dimmer controller and associated cabling between driver & controller	75	nos		16946	1270950
4147	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.570	Type LED ST-11 Fixtures.	5	nos		20858	104290

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4148	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.580	Type LED FD-1 Fixtures.	5	nos		15996	79980
4149	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.590	Type LED FD-2 Fixtures.	50	nos		25997	1299850
4150	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.600	Type LED FD-3 Fixtures.	5	nos		51716	258580
4151	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.680	Type LED BL-1 Fixtures.	5	nos		7715	38575
4152	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3040.20.690	Type LED BL-2 Fixtures.	5	nos		9270	46350
4153	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050	FANS AND EXHAUST FANS					
4154	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050.10	Supply, installation, connection, testing and commissioning of following types of exhaust fans including supply of all necessary supports etc., including fixing of cable glands, lugs with BEE(Bureau of Energy Efficiency) rating of minimum 3 star including all labour and materials and accessories like mounting frame, fixing bolt, wire guard/louvres etc., as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4155	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050.10.10	300 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos		5294	26470
4156	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050.10.20	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos		7148	35740
4157	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050.10.60	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres suitable for Gas group IIC, temperature class T3.	5	nos		8642	43210
4158	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3050.40	Supply, installation, connection, testing and commissioning of 240 V AC, 1200 mm sweep ceiling fan with regulator (labeled as minimum 3-star by Bureau of Energy Efficiency)including providing clamp/hook in RCC slab, if necessary, providing, fixing, ceiling, rose, wiring, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	5	nos		3451	17255
4159	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070	SOCKETS / RECEPTACLES AND SWITCHES / MCB UNITS					
4160	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase, sockets/receptacles and metallic outlet boxes as described below including supply of all connected materials, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4161	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10.10	6 A, 3 pin flush/ surface mounting sockets/receptacles.	5	nos		649	3245
4162	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10.20	6 A, 3 pin plate type flush/ surface mounting sockets/receptacles.	5	nos		340	1700
4163	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10.30	16/6 A, 6 pin flush / surface mounting sockets/receptacles.	5	nos		876	4380
4164	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10.40	16/6 A, 6 pin plate type flush/ surface mounting sockets/receptacles.	5	nos		536	2680
4165	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.10.60	20 A, 3 pin surface mounted industrial type switch socket with plug and sheet steel painted box.	5	nos		2287	11435
4166	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase switches/MCB units, including outlet boxes and associated accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4167	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.10	6 A, piano type flush/surface mounted switches.	5	nos		422	2110
4168	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.20	6 A, plate type flush/surface mounted switches.	5	nos		299	1495
4169	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.30	16 A, piano type flush/surface mounted switches.	5	nos		587	2935
4170	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.40	16 A, plate type flush/surface mounted switches.	5	nos		350	1750
4171	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.50	20A, DP MCB unit in moulded case enclosure for window type air conditioner.	5	nos		2503	12515
4172	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.20.60	32A, DP MCB unit in moulded case enclosure for window / split type air conditioner.	5	nos		2565	12825
4173	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.40	Supply, installation, connection, testing and commissioning of following 415 V, TPN, 4-Pole MCB units in moulded case enclosure including outlet boxes and associated accessories, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4174	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.40.10	16A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3224	16120
4175	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.40.20	32A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3317	16585
4176	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3070.40.30	40A, TPN 4-Pole MCB unit in moulded case enclosure for split/tower type air conditioner.	5	nos		3574	17870
4177	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080	JUNCTION BOXES (OUTDOOR / INDOOR TYPE)					
4178	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080.10	Supply and installation of dust and vermin proof G.I. sheet steel (1.6 mm thick) junction box WP type suitable for outdoor/indoor installation with number of outgoing ways as under, complete with PVC connectors, supply and fixing of cable glands, including supply of required size and number of terminals, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4179	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080.10.10	3 way.	55	nos		2863	157465
4180	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080.10.20	4 way.	5	nos		3152	15760
4181	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080.20	Supply and installation of dust and vermin proof G.I. sheet steel (1.6 mm thick) junction box suitable for indoor installation, complete with 15A, 20 terminals, supply and fixing of cable glands for incoming cable and knock outs for conduit entry for outgoing circuits, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4182	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3080.20.10	Junction box.	5	nos		3430	17150
4183	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090	LIGHTING / POWER PANELS AND DISTRIBUTION BOARDS					
4184	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.10	Supply, installation, connection, testing and commissioning of flame proof weather proof lighting/power panels (for gas group IIA/IIB) as per EIL std. spec. 6-51-0008, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4185	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.10.MG11	40 A, 4 pole incomer MCB isolator and 6 Nos. outgoing double pole MCBs (upto 20 A). Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	2	nos		89929	179858
4186	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.10.MG12	40 A, 4 pole incomer MCB isolator and 12 Nos. outgoing double pole MCBs (upto 20 A) . Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	2	nos		108428	216856
4187	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.10.MG13	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	1	nos		126917	126917

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4188	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.20	Supply, installation, connection, testing and commissioning of safe area lighting/power panels, surface/flush mounting type, wall mounting type in dust tight (with hinged cover) sheet steel enclosure having 4 pole incomer and single pole MCB (9 kA type) for outgoing circuit control with complete wiring, including cable termination, connection and fixing of cable glands, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4189	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.20.MG11	40 A, 4 pole incomer MCB isolator and 6 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	5	nos		27429	137145
4190	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.20.MG12	40 A, 4 pole incomer MCB isolator and 12 Nos. outgoing double pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	4	nos		43147	172588
4191	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3090.20.MG13	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing single pole MCBs (upto 20 A) suitable for outdoor, IP 55 weatherproof. Combined RCCB + MCB for each outgoing circuit (2 Pole RCCB rated 30mA).	1	nos		59410	59410
4192	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100	WIRING					
4193	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30	Circuit wiring with 660 V grade, (sizes given below), FRLS PVC insulated copper wires in already laid surface/concealed conduit from lighting panel/power panel onwards including the supply of wires, termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4194	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.10	3 Nos x 1.5 sq. mm	50	m		128	6400
4195	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.20	3 Nos x 2.5 sq. mm	50	m		170	8500
4196	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.30	5 Nos x 1.5 sq. mm	50	m		191	9550
4197	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.40	5 Nos x 2.5 sq. mm	50	m		247	12350
4198	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.50	7 Nos x 1.5 sq. mm	50	m		278	13900
4199	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.60	7 Nos x 2.5 sq. mm	50	m		371	18550
4200	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.70	9 Nos x 1.5 sq. mm	100	m		371	37100
4201	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.80	3 Nos x 4 sq. mm	50	m		299	14950
4202	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.30.90	5 Nos x 4 sq. mm	50	m		484	24200
4203	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.50	Circuit wiring in non-hazardous areas using (size given below), copper conductor, XLPE insulated, FRLS outer sleeve cables (third core for earthing) from lighting panel/distribution junction box onwards including the supply of cable, junction boxes and cable glands, including termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4204	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.50.40	3 C x 2.5 sq. mm armoured Cu cables.	100	m		247	24700
4205	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.60	Supply and laying of (surface type) G.I. conduit of following diameter and associated fittings from lighting/ power, telephone, fire alarm/plant communication points etc., including supply ofG.I. sheet steel junction boxes with acrylic cover, pull wire, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4206	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.60.10	25 mm diameter.	50	m		453	22650
4207	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.60.20	40 mm diameter.	50	m		711	35550
4208	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.70	Supply and laying of (surface type) approved make of black enamelled steel conduit of following diameter and associated fittings from lighting/power panel, telephone, fire alarm/plant communication points etc., including supply of G.I. sheet steel junction boxes with acrylic cover, pull wire, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4209	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.70.10	25 mm diameter.	50	m		268	13400
4210	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.70.20	40 mm diameter.	50	m		525	26250
4211	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.80	Supply and installation of 50 mm x 50 mm, (18 SWG) 'METSEC' channel with removable cover, including supply of all connected hardware, supports, all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	100	m		937	93700
4212	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.90	Circuit wiring with 660 V grade (sizes given below) PVC insulated copper conductor wires in already installed metsec channel including the supply of wires, termination, connection and harnessing of wires etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4213	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.90.10	1.5 sq. mm wires.	100	m		64	6400
4214	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.90.20	2.5 sq. mm wires.	100	m		85	8500
4215	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.100	Supply and laying of (concealed type) PVC conduit of following diameter and associated fittings in brick walls, RCC slabs/ceilings for lighting/ power/telephone, fire alarm/plant communication points etc., including supply of G.I. sheet steel junction boxes with acrylic cover, pull wire, making cuts and chasis in built up brick work, RCC slabs/ceilings and making good the same, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4216	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.100.10	25 mm diameter.	25	m		170	4250
4217	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.100.20	40 mm diameter.	25	m		288	7200
4218	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.110	Circuit wiring in non-hazardous areas using (size given below), copper conductor, XLPE insulated, FRLS outer sleeve cables (third core for earthing), from lighting/power panel/distribution junction box, excluding the supply of cable, junction boxes and cable glands but including termination and connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4219	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.110.10	3 C x 2.5 sq. mm	10	m		54	540
4220	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.110.20	3 C x 4 sq. mm	10	m		64	640
4221	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.110.30	4 C x 2.5 sq. mm	10	m		72	720

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4222	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.120	Circuit wiring in hazardous areas using (sizes given below) copper conductor, XLPE insulated, FRLS outer sleeve armoured cables (third core for earthing) from lighting/power panel/distribution junction box onwards, excluding the supply of cables, junction boxes and cable glands but including fixing of cable glands, supply and fixing of clamps, cable terminations and connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4223	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.120.10	3 C x 2.5 sq. mm	10	m		74	740
4224	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.120.20	3 C x 4 sq. mm	10	m		85	850
4225	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3100.120.30	4 C x 2.5 sq. mm	10700	m		93	995100
4226	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3120	EMERGENCY LIGHTING					
4227	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.3120.10	Supply, installation, connection, testing and commissioning of emergency lighting unit (min. 5W, 100 lumens output) fed by a self- contained battery rated for 2 hours and charger operating on 240 V AC supply, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	2	nos		5243	10486
4228	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4010	SOIL RESISTIVITY					
4229	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4010.10	Measurement of soil resistivity in accordance with IS:3043, including all labour and materials, as per approved drawings, specifications of this tender and at locations as per directions of Engineer-in-Charge.	2	nos		17932	35864
4230	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4020	EARTH ELECTRODES					
4231	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4020.MC10	Supply, installation, testing and commissioning of maintenance free chemical earth pits complete with earth electrode with Cu bonded high tensile low carbon steel core electrode, as per drawing B857-000-16-50-SK-0102 and all necessary materials including excavation of earth pit, filling with maintenance free chemical for ease of operation and maintenance, back filling, providing necessary brick work, connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	200	nos		56650	11330000
4232	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4020.MB20	Supply, installation, testing and commissioning of 150 mm dia. GI earth electrodes medium class duty (earth pit depth up to 60 Mtr. length) with double run 50 x 6 mm tinned copper strip and double run single core 50 sq.mm. multi stranded, green flexible copper cable, both connected at bottom of electrode. (The earth electrode GI pipe should have M16 holes at every 500 mm across length) and all necessary materials including excavation / drilling / boring for the pit, back filling, providing necessary brickwork, connections, including all labour and materials, as per approved drawing no. B933-000-16-50-SK-4002, specifications of this tender and directions	300	m		25750	7725000
4233	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030	EARTH STRIPS					
4234	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10	Supply, installation and connection of following GI earthing strip along the cable trenches or cable trays or fixing to walls or structures including welding at joints, providing anti-corrosive paint or bitumen and jute covering for welded portion, clamping and necessary hardware for connecting, etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4235	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10.MA01	100x 12 mm	1000	m		1133	1133000
4236	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10.10	75 x 10 mm	100	m		865	86500
4237	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10.20	50 x 6 mm	33400	m		422	14094800
4238	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10.30	40 x 5 mm	7860	m		299	2350140
4239	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.10.40	25 x 3 mm	600	m		180	108000
4240	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20	Supply, installation and connection of following GI earthing strip buried individually at a depth of 500 mm including welding at joints, providing anti-corrosive paint or bitumen and jute covering for welded portion, clamping and necessary hardware for connecting, excavation and refilling etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4241	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20.MA01	100 x 12 mm	200	m		1236	247200
4242	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20.10	75 x 10 mm	100	m		1009	100900
4243	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20.20	50 x 6 mm	38210	m		536	20480560
4244	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20.30	40 x 5 mm	2660	m		422	1122520
4245	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4030.20.40	25 x 3 mm	700	m		299	209300
4246	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040	EARTHING CONNECTION					
4247	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.10	Connecting individual equipment to the earth strip or earth plate with following sizes of G.I. wire / G.I. wire rope including the supply of G.I. wire /G.I. wire rope, lugs, conductors, connecting to the G.I. strip or earth plate and necessary hardware for connection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4248	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.10.10	3/8" dia (10 mm) flexible rope.	4010	m		227	910270
4249	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.10.20	5/8" dia (16 mm) flexible rope.	1710	m		381	651510
4250	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.10.30	8 SWG GI Wire.	1230	m		64	78720
4251	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.20	Supply and installation of 5 m long, 25 sq. mm (168/0.01772") insulated single core copper flexible conductor with crimped type lug at one end and approved crocodile clip at other end, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4252	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.20.10	5 m long, 25 sq. mm (168/0.01772") insulated single core Cu flexible conductor.	5	nos		2884	14420
4253	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.30	Supply and installation of 25 sq. mm (168/0.01772") copper flexibles of following length with copper lugs crimped on both sides for earthing of pipeline vessels, equipments (non electrical) as per std. 7- 51-0112, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4254	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.30.10	300 mm	50	nos		649	32450
4255	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.30.20	500 mm	100	nos		762	76200

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4256	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4040.30.30	1500 mm	20	nos		1391	27820
4257	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4050	EARTH PLATES					
4258	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4050.10	Supply, installation and connection of GI earth plates as per std. 7-51-0103, complete with anchor bolts, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4259	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4050.10.10	GI earth plate as per std. 7-51-0103.	415	nos		1689	700935
4260	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4060	CABLES FOR NGR CONNECTION					
4261	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4060.10	Connecting neutral of the transformer/Generator through following single core PVC/XLPE insulated cable to NGR including supply of Al/Cu conductor, PVC/XLPE insulated, unarmoured and PVC sheathed cables, clamps, necessary supports, all hardware, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4262	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4060.10.30V1	6.6 kV 185 mm² XLPE insulated Aluminium conductor cable for NGR connection	40	m		1833	73320
4263	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4070	EARTHING CONNECTORS					
4264	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4070.10	Supply and installation of MS ear of width 50 mm and thickness 5 mm for earthing of process vessels, steel structures, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4265	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4070.10.10	Minimum 75mm to maximum 300 mm long	10	nos		1102	11020
4266	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4100	EARTHING CABLES					
4267	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4100.30	Supply of 1100 V grade, multi stranded Copper Conductor, XLPE/PVC insulated and unarmoured cables (with green/yellow strips or green colour outer sleeve) of following sizes as per EIL standard specification No. 6-51-0051, data sheet, specifications of this tender and directions of Engineer-in-Charge.					
4268	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4100.30.90	1 C x 185 Sqmm	250	m		2863	715750
4269	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4100.40	Termination & connection of leads of 1100 V grade, multi stranded Copper Conductor, XLPE/PVC insulated and unarmoured, cables of following sizes for earthing of equipment, including supply of lugs, supply and fixing of GI saddles and saddle bars, cutting and stripping of cable insulation, crimping the lug on to the conductor, clamping of the cable, including all labour and materials as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
4270	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.4100.40.90	1 C x 185 Sqmm	10	nos		2925	29250
4271	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010	PLANT COMMUNICATION SYSTEM					
4272	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10	Installation, termination, connection, testing and commissioning of following plant communication system (including back up battery bank, battery charger etc.), including transportation from store/yard to site at the place of installation, assembling and installing in foundation or fixing to wall/structure, aligning, levelling, grouting, cable termination, wiring and all inter-connection and making earth connection etc., first charging of battery, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4273	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.10	Central Exchange Panel along with associated battery, battery charger.	1	nos		21300	21300
4274	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.20	Desk type intercom station upto 24 keys.	5	nos		3760	18800
4275	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.30	Desk type intercom station with above 24 and upto 54 Keys.	5	nos		4275	21375
4276	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.MC21	Desk type intercom station above 54 keys.	16	nos		5150	82400
4277	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.40	Weather Proof Intercom station with upto 3 Nos dual position Keys (FLP/Industrial type)	30	nos		1370	41100
4278	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.50	Weather proof loudspeakers (FLP/Industrial Type).	30	nos		1205	36150
4279	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.60	Loud speakers with amplifier (FLP/industrial type).	15	nos		1710	25650
4280	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.90	Beacon Lamps (FLP/industrial type).	10	nos		5438	54380
4281	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.10.100	Acoustic hood (FLP/industrial type).	10	nos		2184	21840
4282	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.40	Supply of weatherproof type plant communication junction box (PAJB) suitable for outdoor installation with Krone/screw type terminals, including supply of weatherproof double compression cable glands and weatherproof plugs to block the unused entry including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4283	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.40.10V1	PAJB with 1 nos 10 Pair incoming cable(s) and 2 nos 5 Pair outgoing cable(s)	1	nos		26667	26667
4284	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.40.10V3	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos		34124	34124
4285	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.40.10V4	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	2	nos		37523	75046
4286	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.40.10V12	PAJB with 1 nos 100 Pair incoming cable(s) and 20 nos 5 Pair outgoing cable(s)	1	nos		41200	41200
4287	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.50	Installation, testing and commissioning of weatherproof type plant communication junction box (PAJB) suitable for outdoor installation with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly cable, excluding supply of weatherproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4288	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.50.10V2	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos		3245	3245
4289	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.50.10V3	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	2	nos		5840	11680
4290	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.50.10V6	PAJB with 1 nos 100 Pair incoming cable(s) and 20 nos 5 Pair outgoing cable(s)	1	nos		7560	7560
4291	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.50.10V13	PAJB with 1 nos 10 Pair incoming cable(s) and 2 nos 5 Pair outgoing cable(s)	1	nos		3121	3121
4292	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.70	Installation, testing and commissioning of flameproof and weatherproof type plant communication junction box (PAJB) suitable for gas group IIA/IIB or IIC, temperature class T3 with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly filled cables, excluding supply of flameproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4293	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.70.10V5	PAJB with 1 nos 100 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos		14399	14399

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4294	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.70.10V6	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	5	nos		8570	42850
4295	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.70.10V9	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos		9548	9548
4296	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5010.70.10V15	PAJB with 1 nos 30 Pair incoming cable(s) and 6 nos 5 Pair outgoing cable(s)	2	nos		8343	16686
4297	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5020	TELEPHONE SYSTEM					
4298	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5020.60	Supply of weatherproof type telephone system junction box (TDJB) suitable for outdoor installation with Krone/screw type terminals, including supply of weatherproof double compression cable glands and weatherproof plugs to block the unused entry including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4299	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5020.60.10V1	Weather proof TDJB with 1 nos 20 Pair incoming cable(s) and 20 nos 1 Pair outgoing cable(s)	2	nos		16017	32034
4300	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030	FIRE ALARM SYSTEM					
4301	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20	Installation, termination and connection of following fire alarm panel including Power Pack and battery backup system and all associated items, including transportation from store/yard to site at the place of installation, assembling and installation on foundation or fixing to wall or steel structures, aligning, levelling, grouting, termination and connection of cables, making earth connections etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4302	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.10	Fire alarm panel.	2	nos		19446	38892
4303	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.20	Zonal/Repeat fire alarm panels.	2	nos		19446	38892
4304	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.50	Heat detectors.	2	nos		536	1072
4305	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.80	Linear beam detectors.	2	nos		1607	3214
4306	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.100	Break glass type fire alarm boxes.	50	nos		1195	59750
4307	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.120	Exit signs.	10	nos		742	7420
4308	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.140	Hooters.	5	nos		742	3710
4309	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.150	Sirens with starters.	5	nos		1195	5975
4310	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.160	Multi sensor type detectors	5	nos		896	4480
4311	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.170	Fault Isolator modules	5	nos		886	4430
4312	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.180	Input/Monitoring relay module	5	nos		1607	8035
4313	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.190	Output/Control Relay Module	5	nos		1607	8035
4314	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.20.200	Hooter Acknowledge Box	5	nos		1360	6800
4315	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.40	Installation, testing and commissioning of weatherproof type fire alarm junction box (FAJB) suitable for outdoor installation with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly cable, excluding supply of weatherproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4316	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.40.10V16	FAJB with 1 nos 6 Pair incoming cable(s) and 6 nos 1 Pair outgoing cable(s)	1	nos		3409	3409
4317	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.60	Installation, testing and commissioning of flameproof and weatherproof type fire alarm junction box (FAJB) suitable for gas group IIA/IIB or IIC, temperature class T3 with Krone/screw type terminals, including termination and connections of incoming and outgoing non-jelly filled cables, excluding supply of flameproof double compression cable glands, including all labour and materials, as per specifications of this tender and direction of Engineer-in-Charge.					
4318	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5030.60.10V4	FAJB with 1 nos 6 Pair incoming cable(s) and 6 nos 1 Pair outgoing cable(s)	1	nos		3893	3893
4319	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040	LAYING OF COMMUNICATION / FIRE ALARM CABLES					
4320	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.10	Horizontal and vertical laying/pulling through of communication/fire alarm cables of the following overall diameters in ready trays/trenches/conduits or supported on structures including supplying and fixing of GI saddle and saddle bars, stainless steel strip number tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
4321	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.10.10	Cables of overall dia. upto 35 mm.	10000	m		43	430000
4322	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.10.20	Cables of overall dia. above 35 mm.	1000	m		54	54000
4323	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.20	Laying of HDPE ducts for laying of optical fiber cables between various substations, pulling through pipes or supported on structures including supplying and fixing of GI saddle and saddle bars, including supply and fixing of printed stainless steel/ non magnetic non corrosive metal tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
4324	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.20.10	HDPE duct with overall dia. Upto 60mm	35000	m		87	3045000
4325	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.30	Laying of optical fiber cables between various buildings in already laid HDPE conduits for plant communication and fire alarm data highway, feeder differential protection, etc., including supply of all hardware, splice connectors, accessories, pulling through pipes or supported on structures including supply and fixing of printed stainless steel/ non magnetic non corrosive metal tags, including transportation from store/yard to site at the place of installation, unpacking, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4326	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5040.30.10	Cables of overall dia. upto 40 mm.	35000	m		75	2625000
4327	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050	STRAIGHT THROUGH JOINTS COMMUNICATION / FIRE ALARM CABLES					
4328	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050.10	Making of straight through joints for polyethylene insulated armoured jelly filled/ non filled overall PVC jacketed, including supply of all necessary materials for the joint, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4329	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050.10.40V1	For Non-Jelly filled cables of size 2.5 mm² 2 pair	5	nos		690	3450
4330	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050.10.40V2	For Non-Jelly filled cables of size 2.5 mm² 4 pair	5	nos		989	4945

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4331	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050.10.40V3	For Non-Jelly filled cables of size 2.5 mm² 6 pair	5	nos		1277	6385
4332	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5050.10.40V4	For Non-Jelly filled cables of size 2.5 mm² 12 pair	5	nos		2338	11690
4333	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060	END TERMINATIONS FOR COMMUNICATION/ FIRE ALARM CABLES.					
4334	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20	Supply ,Installation, testing and commissioning of Fiber Optic Patch panel (LIU) for following type & number of fiber for OFCs including all accessories for terminating, pigtails with Connectors, patch cords with connectors, Splicing sleeves and splice tray including all labour and materials as per approved drawings specifications of this tender and directions of engineer-in-Charge					
4335	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V1	For 6 fiber Mono mode cable with LC pigtails and LC patch cords	10	nos		37760	377600
4336	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V3	For 6 fiber Mono mode cable with SC pigtails and LC patch cords	10	nos		37760	377600
4337	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V4	For 6 fiber Mono mode cable with ST pigtails and LC patch cords	10	nos		37760	377600
4338	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V5	For 6 fiber Mono mode cable with LC pigtails and SC patch cords	10	nos		37760	377600
4339	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V6	For 6 fiber Mono mode cable with LC pigtails and ST patch cords	10	nos		37760	377600
4340	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V7	For 6 fiber Mono mode cable with SC pigtails and SC patch cords	10	nos		37760	377600
4341	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V8	For 6 fiber Mono mode cable with SC pigtails and ST patch cords	10	nos		37760	377600
4342	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V9	For 6 fiber Mono mode cable with ST pigtails and SC patch cords	10	nos		37760	377600
4343	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.20.10V10	For 6 fiber Mono mode cable with ST pigtails and ST patch cords	10	nos		37760	377600
4344	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.30	Termination of optical fiber cables for various systems including supply of all hardware, splice connectors, accessories, including all labour and materials as per approved drawings specifications of this tender and directions of engineer-in-Charge					
4345	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5060.30.10	6 Fiber	100	nos		4954	495400
4346	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5070	SUPPLY OF COMMUNICATION / FIRE ALALRM CABLE / CONDUITS / DUCTS					
4347	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5070.20	Supply of Mono mode, jelly filled, Optical fiber cable with non metallic armour with following number of cores & construction, as per EIL standard specifications, data sheet, specifications of this tender and directions of Engineer-in-Charge.					
4348	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5070.20.50	6 Fiber unitube construction	15000	m		139	2085000
4349	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5070.40	Supply of HDPE ducts for laying of optical fiber cables between various substations, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge					
4350	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.5070.40.10	HDPE duct with overall dia. Upto 60mm	15000	m		214	3210000
4351	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010	CIVIL WORKS/M.S. CHEQUERED PLATE					
4352	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.10	Excavation and backfilling of trenches for cables and earth strip etc. , for a maximum depth of 1.5 m, shoring, shuttering and dewatering (if necessary) including consolidation and disposal of surplus earth up to a distance of 30 m, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Excavated trench dimensions shall be measured).					
4353	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.10.10	Excavation and backfilling of trenches in all types of soil except rock.	9000	m³		711	6399000
4354	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.10.20	Excavation and backfilling of trenches in all types of soil including rock.	1000	m³		1257	1257000
4355	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.20	Supply and laying of 40 mm size gravel in one layer of 100/150 mm thick including dressing of soil surface and laying the aggregate in uniform layer and density, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge (Aggregate will be measured in boxes of size 1.5 m x 1.5 m x 0.5 m which shall be taken as 1 cubic metre, the boxes are to be furnished by the contractor free of cost for measuring purposes).					
4356	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.20.10	40 mm size gravel.	100	m³		1803	180300
4357	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.30	Supply and spreading of approved fine river sand/stone dust in cable trenches, including all labour and materials, specifications of this tender and directions of Engineer-in-Charge.					
4358	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.30.10	Fine river sand.	25	m³		3440	86000
4359	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.30.20	Stone dust grading Zone-II, grading limits as per IS-383.	4000	m³		1761	7044000
4360	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.MG40	Supply and spreading of approved CLAY BRICKS - TYPE-5 of 75 mm thickness in cable trenches for cable protection, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. (Actual area of laid brick surfaces shall be measured).					
4361	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.MG40.01	Bricks	250	m²		464	116000
4362	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.50	Providing and laying plain cement concrete for all depths below and up to a plinth level in foundations including tamping, ramming, vibrating, curing, shuttering etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed, including supply of all materials and all complete for concrete of M-15 grade with 20 mm and down size graded crushed stone aggregates, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4363	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.50.10	Plain cement concrete.	5	m³		7014	35070
4364	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.60	Supply, fabrication and installation of 6 mm thick M.S. chequered plate for covering floor cut- outs/cable trenches etc., including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4365	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.60.10	6 mm thick M.S. chequered plate.	1055	m²		6252	6595860
4366	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.70	Supply and installation of fire proof sealing system as per IEC-60332 including supply and fabrication of steel frames and other accessories (cement, gravel, sand etc.) including drilling, cutting, welding, surface preparation, dressing/ chipping of concrete, enlargement etc. including all minor masonry and structural works and repair of all damages in line with the enclosed job specification and instructions of the Engineer-in-Charge	150	m³		53931	8089650
4367	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.80	Making through and through cut outs in pockets of size 150 mm dia in the RCC floor/walls of trenches/buildings of thickness upto 200mm for facilitation cable entries using concrete cutting machines including all labour and materials as per approved drawings, specifications of this tender and directions of Engineer -in-charge	5	nos		1576	7880

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4368	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.90	Making through and through cut outs in pockets of following shape and size in the RCC floor/ walls of trenches/ buildings of thickness above 200 mm and upto 400 mm for facilitating cable/ duct entries, using concrete cutting machines and making cut out good using plastering and painting including all material and labour as per approved drawings, specification of this tender and directions of Engineer-in-charge.					
4369	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.90.10V1	Circular Cut Out of diameter 150 mm	2	nos		3214	6428
4370	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.90.20V1	Rectangular Cut Out of length 200 mm width 200 mm	2	nos		4285	8570
4371	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.6010.90.20V2	Rectangular Cut Out of length 300 mm width 300 mm	2	nos		5356	10712
4372	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010	LAN SYSTEMS					
4373	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.10	Supply, installation, connection, testing and commissioning of weatherproof power panels for UPS power distribution having following incomer & outgoing feeders, including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer-in-charge.					
4374	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.10.10	32A, double pole incomer MCB isolator and 6 nos outgoing double pole 10A MCBs isolator with 2nos, 10A semiconducting fuses.	2	nos		13339	26678
4375	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.10.20	32A, double pole incomer MCB isolator and 12 nos outgoing double pole 10A MCBs isolator with 2 nos, 10A semiconducting fuses ,	2	nos		16810	33620
4376	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.10.30	63A, double pole incomer MCB isolator and 18 nos outgoing double pole 10A MCBs isolator with 2 nos, 10A semiconducting fuses	2	nos		19137	38274
4377	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.20	Supply, installation, termination, testing and commissioning of flush mounted CAT-6 UTP JACK (Information Outlets) including supply of all connected materials(i.e Face plates, Surface mount box, patch cord at I/O end), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge.	2	nos		711	1422
4378	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.30	Circuit wiring with following cables for LAN in already laid surface/concealed conduit from Etherswitch rack onwards to Cat-6 UTP Jack (Information outlet) including the supply of cables, termination and connection at both ends (i.e at jack panel end & at the I/O end), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-charge.					
4379	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.30.10	1 no. CAT-6 UTP cable	50	m		75	3750
4380	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.30.20	2 nos. CAT-6 UTP cable	50	m		129	6450
4381	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.30.30	3 nos. CAT-6 UTP cable	50	m		204	10200
4382	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.50	Supply, installation, connection, testing and commissioning of following ratings of 240 V, single phase, sockets/receptacles/switches as described below including all connected materials, outlet boxes and associated accessories including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
4383	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.50.10	3 Nos 6 A, 3 pin flush/ surface mounting sockets/receptacles with 1 Nos 16 A, piano type flush/surface mounted switches.	5	nos		2493	12465
4384	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.8010.50.20	3 nos 6 A, 3 pin plate type flush/ surface mounting sockets/receptacles with 1 Nos 16 A, plate type flush/surface mounted switches.	5	nos		1380	6900
4385	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000	PAINTING & MARKING					
4386	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.10	Letter painting and marking of all buses of switchboards, all incomers, bus couplers, outgoings with details of Tag No, feeder rating in KW/Amp, sending end source, in the front of the panels and bus bar, panel nos.etc. on the rear side of the panels for all switchboards, all other substation equipment viz.transformers, capacitors, neutral grounding resistors, VFD panels, other panels, etc for equipment housed in electrical substations including supply of all material such as stickers, enamel paints, stencil, etc including supply of all labour, materials as per the specification of this tender and directions of Engineer-in-Charge.					
4387	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.10.10	Each alphabet/character upto 2 inch in height/length	7000	nos		54	378000
4388	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.10.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	24000	nos		64	1536000
4389	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.10.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	16000	nos		74	1184000
4390	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.10.40	Each alphabet/character above 8 inch and Upto 12 inch in height/length	1500	nos		85	127500
4391	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.20	Letter painting of tag nos., applicable circuit nos. for identification with red/black/white paint for all outdoor equipment in safe and hazardous areas viz. light fittings, control gear boxes, lighting/power panels, welding receptacles, convenience receptacles, local control stations, fire alarm manual call points, fire alarm detectors, motors, field call stations, loud speakers, etc. including supply of enamel paint, all hardware as required, supply of all labour, materials as per the specification of this tender and directions of Engineer-in-Charge.					
4392	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.20.10	Each alphabet/character upto 2 inch in height/length	7500	nos		74	555000
4393	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.20.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	9000	nos		85	765000
4394	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.20.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	5000	nos		96	480000
4395	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.9000.20.40	Each alphabet/character above 8 inch and Upto 12 inch in height/length	1000	nos		106	106000
4396	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1	MV (415V) FEEDER MODIFICATION / ADDITION Supply, installation, connection (internal wiring), testing and commissioning of drawout type following feeders for 415V Switchgear in vacant module in existing switchboards as per hardware datasheet and component datasheet B957-000-16-50-DS-1802, including interfacing with existing Substation Automation System (SAS) & ECS including all cabling & connections & requisite modifications in existing SAS/ECS, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge. Services of OEM shall be availed					
4397	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.01	32A MCCB with E/F release feeder as per hardware datasheet B957-000-16-50-DS-1830.	2	nos		32960	65920
4398	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.02	63A MCCB with E/F release feeder as per hardware datasheet B957-000-16-50-DS-1830.	2	nos		32960	65920
4399	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.03	63A MCCB with E/F release feeder with timer and contactor as per hardware datasheet B957-000-16-50-DS-1837.	2	nos		40170	80340
4400	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.04	125A MCCB with E/F release feeder with Contactor as per hardware datasheet B957-000-16-50-DS-1831.	2	nos		51500	103000
4401	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.05	250A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		61800	123600
4402	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.06	FVNR-15 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1826	2	nos		51500	103000
4403	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.07	FVNR-30 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1828.	2	nos		56650	113300

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4404	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.08	FVNR-60 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1828.	2	nos		72100	144200
4405	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.09	FVNR-100 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1829.	2	nos		82400	164800
4406	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.10	FVNR-150 DOL motor feeder as per hardware datasheet B957-000-16-50-DS-1829.	2	nos		113300	226600
4407	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.11	400A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831.	2	nos		123600	247200
4408	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.12	32A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831.	2	nos		41200	82400
4409	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA1.13	63A MCCB feeder with Contactor, CBCT & ELR as per hardware datasheet B957-000-16-50-DS-1831	2	nos		43260	86520
4410	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA5	MCB BOX					
4411	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA5.01	MCB BOX for Battery Rooms					
4412	B	B957-999-16-50-PK-SOR-9501-B-2M	01EE.MA5.01.01	Supply, installation, connection, testing and commissioning of safe area MCB Box surface/flush mounted type, wall mounting type (with hinged cover) sheet steel enclosure with canopy having 4 nos. single pole MCBs (9kA type, upto 20 A) with complete wiring, suitable for outdoor, IP 55 weatherproof, including cable termination, connection and fixing of cable glands (for 4 nos. incoming and 4 nos. outgoing, 3C X 2.5 sqmm. armoured cables), including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.	2	nos		61800	123600
4413	B	B957-999-16-51-PK-SOR-9501-B-1M	01II	INSTRUMENTATION					
4414	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10	PRESSURE GAUGES AND ACCESSORIES (Excl. supply of Impulse pipe/Tubing materials)					
4415	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10	Installation of Line mounted or Remote mounted or Local Gauge Board mounted Pressure gauge/ Pressure gauge with Pulsation Dampener/ Syphon/ Over-range Protector (direct/ surface mounted/ diaphragm seal type) inclusive of mounting of instrument, supply and erection of supports/tray, mounting on support (if support required) , laying of capillary on tray, fabrication and installation of manifolds/ impulse lines with supports as per standards indicated below, hydraulic testing and painting of supports but exclusive of Supply of Instrument, Gauge Board, Yoke, Piping material and Calibration.					
4416	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10.1V5	In Stainless Steel as per Standard 7-52-0432/1112	7	nos		4380	30660
4417	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10.1V6	In Carbon Steel as per Standard 7-52-0432/1112	56	nos		4220	236320
4418	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10.1V12	In Carbon Steel as per Standard 7-52-0433/1113	3	nos		4220	12660
4419	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10.1V52	In Carbon Steel as per Standard 7-52-2111	7	nos		5360	37520
4420	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.10.10.1V58	In Carbon Steel as per Standard 7-52-2126	29	nos		11220	325380
4421	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30	PRESSURE INSTRUMENTS (Excl. supply Impulse pipe/Tubing materials)					
4422	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10	Installation of Pressure Transmitters/ Pressure Switches (with or without Pulsation Dampener, Over-range Protector)/ Diaphragm seal type Pressure Transmitters/ Diaphragm seal type Pressure Switches including mounting on Yoke/ Surface, supply of supports for capillary, supply and erection of supports for impulse lines wherever required, fabrication and installation of manifolds/ impulse lines with supports as per Standard indicated below, laying of capillary on supports, hydraulic testing and painting of supports but exclusive of Supply of Instrument, Piping/tubing materials, all Electrical/ Pneumatic connections, Yoke and Calibration.					
4423	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10.1V30	In Carbon Steel as per Standard 7-52-1143	53	nos		3090	163770
4424	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10.1V31	In Carbon Steel as per Standard 7-52-1221	1	nos		5360	5360
4425	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10.1V50	In Stainless Steel as per Standard 7-52-1143	8	nos		3090	24720
4426	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10.1V86	In Carbon Steel as per Standard 7-52-2110	10	nos		11120	111200
4427	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.30.10.MC02	In Carbon Steel as per Standard 7-52-1211	2	nos		15860	31720
4428	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.40	DIFFERENTIAL PRESSURE INSTRUMENTS (Excl. supply of Impulse pipe/Tubing materials)					
4429	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.40.10	Installation of Differential Pressure Transmitters (including one side capillary type)/ Differential Pressure Switch(including one side capillary type)/ Diaphragm seal type DP Transmitters/ Diaphragm seal type DP Switch including mounting on Yoke/ Surface, supply and erection of supports for impulse lines wherever required, fabrication and installation of manifolds/ impulse lines with supports as per Standard indicated below, supply and fabricating of supports for capillary, laying of capillary on supports, painting, installation of flushing connection, hydraulic testing of impulse lines as per standard indicated below but exclusive of Supply of Instrument, Piping material, all Electrical/ Pneumatic connections, Yoke and Calibration.					
4430	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.40.10.1V3	In Carbon Steel as per Standard 7-52-0452/1171	11	nos		26160	287760
4431	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.90	DIFFERENTIAL PRESSURE (FLOW) TRANSMITTERS (Excl. supply of Impulse pipe/Tubing material)					
4432	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.90.10	Installation of Differential pressure(with or without integral manifold)/ Diaphragm Seal Type Differential Pressure flow instruments including Mounting on Yoke, supply of supports for impulse lines/ manifolds/ capillary, fabrication and Installation of manifolds/ impulse lines with supports as per Standard indicated below, laying of capillary on supports, hydraulic testing and painting of supports but exclusive of Supply of Instruments, Piping material, all Electrical/ Pneumatic connections, Yoke and Calibration.					
4433	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.90.10.1V20	In Carbon Steel as per Standard 7-52-1305	14	nos		3090	43260
4434	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.120	CORIOLIS MASS FLOWMETERS					
4435	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.120.10	Installation of Transmitters/ Preamplifiers on Yoke/ Instrument (if required), including laying and termination of inter connection cables with supports for cables, painting of supports but exclusive of Supply of Instrument, Yoke and Calibration.					
4436	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.120.10.1	Installation of Transmitters/ Preamplifiers for Coriolis Mass Flowmeters	4	nos		7360	29440
4437	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205	MAGNETIC LEVEL GAUGES					
4438	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205.10	Installation of Magnetic Level Gauges on Vessel/ Piping/ Stand pipes with minor modification wherever required, providing intermediate supports wherever necessary fabrication and installation of drain valve/ vent valve assembly as per Standard Nos. indicated below, hydraulic testing of gauge, exclusive of Supply of Instruments, Piping materials and Calibration.					

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4439	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205.10.1V1	In Carbon Steel as per Standard 7-52-0484/1520	10	nos		5460	54600
4440	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205.10.1V3	In Stainless Steel as per Standard 7-52-0484/1520	2	nos		5570	11140
4441	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205.10.1V5	In Carbon Steel as per Standard 7-52-1562	2	nos		5460	10920
4442	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.205.10.1V6	In Stainless Steel as per Standard 7-52-1562	2	nos		5570	11140
4443	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.240	SERVO TYPE TANK GAUGES					
4444	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.240.10	Installation/ interconnection of Servo type Gauges with/ without Tank Farm Management (TFM) System components. Installation of Gauge, Isolation ball valve, Calibration chamber on flanged equipment nozzle, with or without still well, Junction boxes with barriers, power switch, all Electrical connections but exclusive of Supply of Instrument, still well and Calibration/ Setting of gauges.					
4445	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.240.10.1	Servo Gauge Installation	12	nos		10280	123360
4446	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.240.30	Installation of tank side indicators/ Electronic units (total system for indication, transmission, marshalling etc. as required for one tank) including mounting on yoke/ support, fabrication and erection of supports and laying of cable up to instrument/ indicator with clamps, termination of cables at both ends but exclusive of Supply of Instruments, Yoke and Calibration.					
4447	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.240.30.1	Tank Side Indicator Installation	12	nos		5520	66240
4448	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260	RADAR LEVEL INSTRUMENTS					
4449	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.10	Installation of radar sensor and antenna, flanged type connection on equipment nozzle/ rail mounting with/without still well, but exclusive of supply of instruments. Installation of electronics units (total system for indication, transmission, marshalling etc. for one tank), including mounting on Yoke, supply of angle tray with supports, fabrication and erection of supports and laying of cable up to instrument/probe with clamps, termination of cables at both ends, but exclusive of supply of Instruments, supply of yokes and Calibration.					
4450	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.10.1	Installation of radar type of level instruments	49	nos		7070	346430
4451	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.20	Installation of SINGLE point/ AVERAGING type RTD on flanged equipment nozzle, all electrical connections but exclusive of Supply of Temperature element, thermowell.					
4452	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.20.2	Averaging type Temperature Element Installation	21	nos		4870	102270
4453	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.30	Installation of tank side indicator/electronic unit (total system for indication/ transmission/marshalling etc., as required for one tank) including mounting on yoke/support, fabrication and erection of supports, laying and termination of interconnecting cable up to instrument/ indicator with clamps, termination of cables at both ends, painting of supports but exclusive of supply of instruments, yoke, cables and calibration.					
4454	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.30.1	Tank Side Indicator	30	nos		4870	146100
4455	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.40	Installation of junction box if necessary, for multidropping including mounting on yoke/support, laying and termination of interconnecting cables between gauge head, temperature element, tankside indicator and interconnecting with other gauges as appliable, in line with mutidropping/cabling recommended by vendor.					
4456	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.40.1	Junction box installation and interconnecting cables	8	nos		3680	29440
4457	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.50	Installation of control electronics cabinet					
4458	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.260.50.1	Installation of control electronics cabinet	2	nos		5150	10300
4459	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.330	TEMPERATURE INSTRUMENTS					
4460	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.330.10	Installation of Temperature Indicators/ Gauges (Filled system/ Bimetallic) RTD/ Thermocouple/ Temperature Switches/ Temperature transmitters with flanged thermowell inclusive of installation of machined/ built-up thermowells on the nozzle and installation of Instruments, Electrical/ Pneumatic connection but exclusive of Supply of Instruments/ Elements/ Thermowell, and Calibration.					
4461	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.330.10.2	Temperature Indicator/ Gauges (Bimetallic Type) with thermowell on flanged wells	19	nos		1190	22610
4462	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.340	TEMPERATURE TRANSMITTERS (REMOTE MOUNTED)					
4463	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.340.10	Thermocouple/ RTD element with thermowell, along with Temperature Transmitter remote mounted. Installation of transmitter including mounting on yoke, fabrication and erection of supports with clamps and laying of extension/RTD cable upto thermocouple, termination of cables at both ends, painting of supports but exclusive of Supply of Instruments, Cable, Yoke and Calibration.					
4464	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.340.10.1	Temperature Transmitter and Thermocouple with flanged well	36	nos		2280	82080
4465	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.420	ANALYZER CABINETS					
4466	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.420.10	Installation of prefabricated analyzer cabinets in analyzer room/ field of following sizes including supply, fabrication and installation of base frame grouting and fixing of foundation bolts as necessary, removal and reinstallation of analysers and its accessories like sampling system, racks, air conditioners, vortex cooler, installation of fresh air duct if necessary, connecting all utility lines to the cabinet as required but exclusive of supply of cabinet and analysers, painting of cabinet and calibration.					
4467	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.420.10.10	Volume less than 1m (W) x 1m (D) x 2.5m (H).	5	nos		17510	87550
4468	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.420.10.20	Volume less than 1.5m (W) x 1.5m (D) x 2.5m (H) but more than 1m (W) x 1m (D) x 2.5m (H).	5	nos		23280	116400
4469	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.430	ANALYSER SHELTER					
4470	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.430.20	Unloading of Analyser Systems, material at storage area and transportation of Analyser Shelters of the following sizes from Site Storage area to the Process unit Installation location					
4471	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.430.20.10	Volume equal or less than 3m (W) x 3m (D) x 2.5m (H)	2	nos		20650	41300
4472	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.435	INSTALLATION OF PRE-FABRICATED SKIDS					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4473	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.435.10	INSTALLATION OF SKID MOUNTED PACKAGES(SINGLE/MULTIPLE SKIDS): Handling and transportation of Package consisting single or multiple skids from Owner's storage point to work site/contractor's stores. Assembly of sub-assemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (including supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of inter- connecting piping including some amount of cutting, welding, NDT, hydrotesting/pneumatic testing, wherever required. Purging the line with air/gas as per the instruction of Package supplier (wherever applicable), providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below :					
4474	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.435.10.MC01	Terminal Automation Skids of 10 MT	13	nos		43260	562380
4475	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.440	DETECTOR SYSTEMS					
4476	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.440.14	Installation of Fire and Gas detectors/monitors, beacon lights and hooters including earthing of Fire and Gas detector, supply of supports but exclusive of Supply of Detectors, Yoke and Calibration.					
4477	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.440.14.1	LEL Detectors	116	nos		1830	212280
4478	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.440.14.9	Beacon Lights	10	nos		1500	15000
4479	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.440.14.10	Hooters	10	nos		1500	15000
4480	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.450	MISCELLANEOUS ITEMS AND DEVICES					
4481	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.450.10	Mounting of Miscellaneous instrument items as listed below on Yoke; fabrication and erection of Supports and including installation of instrument items, painting of supports but exclusive of Supply of Instrument items, Piping/ Tubing material / Calibration and supply and erection of Yoke support.					
4482	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.450.10.5	Flame-proof Push Button Station/ Selector Switches /Lamps.	10	nos		1840	18400
4483	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.450.10.33	Speed Sensor/ Transmitter	2	nos		1190	2380
4484	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.450.10.36	Vibration probes/Transmitter	2	nos		2280	4560
4485	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.470	PANEL/ RACK ITEMS					
4486	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.470.10	Mounting of miscellaneous instrument items on panels/ racks etc. as listed below including installation of items, fabrication and erection of supports pneumatic/ electrical connections but exclusive of supply of Instrument items, their setting/ Calibration.					
4487	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.470.10.5	Push Buttons, Selector Switches, Lamps, Bypass Switches	10	nos		1190	11900
4488	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500	CALIBRATION/ TESTING					
4489	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.20	Cleaning, adjusting stroke/ positioner, stroke speed checking of Control and On-off (Shutdown) valves. Providing equipments, necessary test jig, Instrument Air, Nitrogen Cylinders, test reports, all consumable and loop testing. Excludes flow calibration					
4490	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.20.10	Control Valves	32	nos		1730	55360
4491	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.20.20	On-off valves (SDV/ ROV)	80	nos		1410	112800
4492	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.20.21	Self Actuated Pressure reducing valves	19	nos		1410	26790
4493	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60	Cleaning, calibration of the instruments listed below including removal of instrument from reinstalled locations like panels, enclosures, racks, field etc., and fixing them back in respective places, providing equipments, necessary test jig, Instrument Air, Nitrogen Cylinders, test reports, all consumable, except for special imported test equipments for electronic instruments to be supplied by owner if available.					
4494	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.1	Pressure gauges	95	nos		680	64600
4495	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.3	Diaphragm Seal Pressure Gauges	6	nos		680	4080
4496	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.11	Pressure transmitters	83	nos		1080	89640
4497	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.13	Diaphragm Seal Pressure Transmitters	2	nos		1080	2160
4498	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.23	Differential Pressure Transmitters for Flow, Level and D.P.	14	nos		1190	16660
4499	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.33	Temperature gauges	19	nos		1190	22610
4500	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.39	Temperature Transmitters	36	nos		1190	42840
4501	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.42	Special Level Instruments/ Guided Wave / Ecclipse type Radar level instruments	4	nos		1730	6920
4502	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.44	Tank Level Instrument (Radar type)	49	nos		1730	84770
4503	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.45	Servo Type Tank Gauges	12	nos		1730	20760
4504	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.61	Electronic Local Indicator	6	nos		800	4800
4505	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.60.81	LEL Detectors	116	nos		1190	138040
4506	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.70	Cleaning, checking and functional tests for flowmeters. Providing equipments, necessary test jig, Instrument Air, test reports, all consumable, except for special imported test equipments for electronic instruments to be supplied by owner if available. Excludes flow calibration.					
4507	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.500.70.13	Coriolis Mass flowmeters	4	nos		3460	13840
4508	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510	LOOP CHECKING					
4509	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10	Loop checking (excluding calibration/ testing) of the instruments listed below including verifying the functional performance of all elements comprising the loop, thereby ensuring proper interconnections and operation, with all other specifications inline with clause 4.13 of Standard specification for Erection tender 6-52-0060.					
4510	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.2	Pressure transmitters	150	nos		430	64500
4511	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.3	Diaphragm Seal Pressure transmitters	10	nos		430	4300

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4512	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.5	Differential Pressure Transmitters for Flow, Level and D.P.	30	nos		430	12900
4513	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.10	Temperature Transmitters	80	nos		430	34400
4514	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.12	Special Level Instruments/ Guided Wave / Ecclipse type Radar level instruments	10	nos		430	4300
4515	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.13	Tank Level Instruments (Radar type)	49	nos		430	21070
4516	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.15	Electronic Local Indicator	6	nos		430	2580
4517	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.17	Gas Detectors	116	nos		430	49880
4518	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.35	Push Button/Selector Switches/Lamps	60	nos		430	25800
4519	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.36	Annunciator Window	60	nos		430	25800
4520	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.40	Hooter / Beacon	10	nos		430	4300
4521	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.41	Control valve positioner	13	nos		430	5590
4522	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.46	Solenoid Valves	27	nos		430	11610
4523	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.47	Limit Switches	10	nos		430	4300
4524	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.49	MOV - Feedback	30	nos		430	12900
4525	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.10.50	MOV - Command	45	nos		430	19350
4526	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.40	Loop checking (excluding calibration/ testing) of the flowmeters listed below including verifying the functional performance of all elements comprising the loop, thereby ensuring proper interconnections and operation, with all other specifications inline with clause 4.13 of Standard specification for Erection tender 6-52-0060.					
4527	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.510.40.5	Coriolis Mass flowmeters	4	nos		430	1720
4528	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550	SUPPLY ITEMS					
4529	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.20	Supply of Junction boxes of various types and specifications					
4530	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.20.1V2	Junction Box, Weatherproof type for 12 Pair Cable	32	nos		9390	300480
4531	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.20.1V3	Junction Box, Weatherproof type for 3 Way	5	nos		7810	39050
4532	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.20.2V1	Junction Box, Weatherproof + Flameproof (Gas Groups -IIA/IIB) type 3 Way	2	nos		12460	24920
4533	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.20.2V5	Junction Box, Weatherproof + Flameproof (Gas Groups -IIA/IIB) type for 12 Pair Cable	32	nos		14040	449280
4534	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30	Supply of Cable glands of various types and specifications					
4535	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.3V1	Weatherproof Cable gland,Ni plated Brass material with PVC shroud, 1 1/2 " ET with check nut	150	nos		470	70500
4536	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.3V3	Weatherproof Cable gland,Ni plated Brass material with PVC shroud, 1" ET with check nut	75	nos		150	11250
4537	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.3V4	Weatherproof Cable gland,Ni plated Brass material with PVC shroud, 3/4 " ET with check nut	75	nos		100	7500
4538	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.3V5	Weatherproof Cable gland,Ni plated Brass material with PVC shroud, 1/2 " ET with check nut	75	nos		140	10500
4539	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.6V1	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 1/2" NPTM	1024	nos		200	204800
4540	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.6V2	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 3/4" NPTM	152	nos		250	38000
4541	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.30.6V4	Double compression type Cable gland, weatherproof + Flameproof (Gas Group IIA/IIB) type, SS 304 material with PVC shroud, 1 1/2" NPTM	64	nos		780	49920
4542	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.40	Supply of plugs for cable entries of various types and specifications					
4543	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.40.4V1	Plug, weatherproof + flameproof (Gas Group IIA/IIB) type, SS 304 material, 1/2" NPTM	256	nos		120	30720
4544	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.40.4V3	Plug, weatherproof + flameproof (Gas Group IIA/IIB) type, SS 304 material, 1 1/2" NPTM	64	nos		470	30080
4545	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50	Supply of compression tube fittings in Stainless Steel of various types and specifications					
4546	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.1V2	Male Connector: Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	500	nos		390	195000
4547	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.1V3	Male Connector: Material: SS-316 : Size: 1/4" NPTM X 1/2" OD 153 Bar	100	nos		320	32000
4548	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.1V75	Female Connector (HC Service): Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	40	nos		410	16400
4549	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.1V76	Male Connector (HC Service): Material: SS-316 : Size: 1/2" NPTM X 1/2" OD 153 Bar	100	nos		360	36000
4550	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.3V1	Tube Union: Material: SS-316 ; Size: 1/2" OD x 1/2" OD 153 Bar	750	nos		320	240000
4551	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.4V1	Tube Cap; Material: SS-316 ; Size : 1/2" OD 153 Bar	200	nos		200	40000
4552	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.4V12	Tube Cap; Material: SS-316 (HC Service) ; Size : 1/2" OD 153 Bar	75	nos		200	15000
4553	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.5	SS 316 Ball Valve 1/2" NB with NPTF ends 41 Bar	350	nos		1560	546000
4554	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.6	6 Way Air Manifold SS316	18	nos		11670	210060
4555	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.50.7	12 Way Air Manifold SS316	9	nos		19480	175320
4556	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.70	Supply of instrument tubes of different types and specifications					
4557	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.70.2V2	SS316L tube 1/2" OD 153 Bar	900	m		280	252000
4558	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.550.70.3V2	SS316L (HC Service) Tube 1/2" OD 153 Bar	200	m		280	56000
4559	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600	JUNCTION BOX INSTALLATION					
4560	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.10	Installation of weatherproof junction boxes including supply, fabrication and installation of supports, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
4561	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.10.1	For cable size 6P x 0.5/1.0/1.5/2.5 mm² / 16 AWG Signal/FF/Alarm/ Control	10	nos		3580	35800
4562	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.10.5	For cable size 12Px0.5/1.0/1.5/2.5 mm² Signal/Alarm/ Control	10	nos		4120	41200

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4563	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.11	Installation of weatherproof and/or flameproof junction boxes on free standing support including supply, fabrication and installation of supports along with required ISMC channel and accessories and as per instructions of Site In-charge, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
4564	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.11.1	As per installation drawing 7-52-0106 (A) - three junction box installation bottom entry	10	Set		16270	162700
4565	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.11.2	As per installation drawing 7-52-0106 (B) - two junction box installation bottom entry	15	Set		13490	202350
4566	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.20	Installation of weatherproof and flameproof junction boxes including supply, fabrication and installation of supports, installation of junction boxes, supply of 14 SWG GI wire (max. length 10 m per Junction Box), laying and connection, screwing plugs for unused entries and painting but exclusive of supply of junction boxes and glands/ fittings.					
4567	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.20.5	For cable size 12P x 0.5/1.0/1.5/2.5 mm²/16 AWG Signal/FF/Alarm/ Control	10	nos		4120	41200
4568	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.20.43	For cable size 8T x 1.5/ 2.5 mm² RTD/ Gas Detector	2	nos		4750	9500
4569	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.52	Installation of all insert blocks, stay plates, unused blocks with cables piece inserted, end packing etc. of Multi Cable Transit within the frame for Cable entry including necessary civil works, welding, supply and installation of additional steel plate for unused portion of cutouts, fixing of frames, pulling cables to blocks and installation of blocks on frames as per manufacturer's recommendation excluding installation of Multi Cable Transit frames on wall					
4570	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.52.5	6 + 6 x 10	1	nos		23320	23320
4571	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.600.52.7	6 + 6 x 6	1	nos		20990	20990
4572	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610	LAYING OF CABLES					
4573	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.10	Laying of instrumentation cables for signal, alarm, shutdown, control and signal cable on ducts, main trays, perforated trays, angle trays, trenches (including opening of cable duct covers if required through IRCs {Instrument Road Crossings}) including clamping, glanding the cables, termination at both ends including shield/ drain/ communication wire, providing and fixing identifying tags and megger testing but exclusive of supply of cables and erection of ducts, main tray, perforated tray/ angle trays and preparation of cable trench.					
4574	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.10.9	Signal/ Alarm/ Control Cables of cable sizes 24C /12P x 1.5/ 2.5 mm²	104800	m		40	4192000
4575	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.10.12	Special armoured serial link MODBUS TCP/IP/RS485 Serial/ cable	16400	m		30	492000
4576	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.30	Laying of thermocouple/ RTD/ LEL Detector/ H2S Detector cables on ducts, main trays, perforated trays, angle trays, trenches (including through IRCs {Instrument Road Crossings}) including opening of cable duct covers if required clamping, glanding the cables, termination at both ends including shield/ drain/communication wire providing and fixing of identifying tags and megger testing but exclusive of supply of multi cables and erection of ducts, main tray, perforated tray/angle tray and preparation of cable trench.					
4577	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.30.41	1 Triad/ Quad x 1.5 mm² RTD/ LEL Cable	174	m		30	5220
4578	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.30.54	8 Triad/ Quad x 2.5 mm² RTD/ LEL Cable	16460	m		40	658400
4579	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.30.55	2 Triad/ Quad x 1.5 mm² RTD/ LEL Cable	54	m		40	2160
4580	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.80	Laying of power cables on ducts, main trays, perforated trays, angle trays, trenches (including through IRCs) including opening of cable duct covers if required clamping, glanding the cables, termination at both ends including shield/ drain/ communication wire providing and fixing of identifying tags and megger testing but exclusive of supply of multi cables and erection of ducts, main tray, perforated tray/ angle tray and preparation of cable trench					
4581	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.80.1V2	For cable size 2C x 6 mm²	1150	m		30	34500
4582	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.80.1V7	For cable size 2C x 2.5 mm²	5400	m		20	108000
4583	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.610.80.1V10	For cable size 2C x 4 mm²	8900	m		30	267000
4584	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615	Laying of Fibre Optic cables with or without HDPE conduit					
4585	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1	Laying of Fibre Optic / system cables on ducts, main trays, perforated trays, angle trays, trenches (including through Instrument Road Crossing) including opening of cable duct covers if required, clamping, glanding the cables, termination at both ends including shields , providing and fixing of identifying tags and testing but exclusive of supply of fibre Optic/System cables and erection of ducts, main trays, perforated trays,/angle trays and preparation of cable trench.					
4586	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1.1	Laying of FO/system cables of various sizes upto 30mm OD	87000	m		30	2610000
4587	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1.2	Laying of FO/system cables of various sizes upto 30mm OD along with HDPE conduits of 40 mm OD but exclusive of supply of HDPE conduits.	13600	m		60	816000
4588	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1.4	Optical Fibre Cable Splicing and termination of each Fibre within room at LIU through connectors, OTDR (Optical noise/dB) testing, after looping in loop box, OFC site acceptance testing all complete as per specifications	976	nos		6820	6656320
4589	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1.5	Optical Fibre Cable Splicing and termination of each fibre at field at LIU through connectors, OTDR (Optical noise/dB) testing, after looping in loop box, OFC site acceptance testing all complete as per specifications	74	nos		9090	672660
4590	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.615.1.MH01	Laying of FO Patch cords/ethernet cable within the building	4000	m		20	80000
4591	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.620	TRENCH WORK					
4592	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.620.10	Excavation of trenches for burying the cable, preparation of same for laying of cable, filling with sand, laying of brick, back filling and compacting of the excavated earth as per specifications including supply of sand and bricks and as per cable trench layout and removal of surplus earth as per instructions of Engineer- in-Charge.					
4593	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.620.10.MC01	Trench size 300 mm (W) x 1000 mm (D)	11300	m		1940	21922000
4594	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.650	EARTHING					
4595	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.650.10	Supply, laying and termination of both ends of earthing cables from earth grid pit to the DCS/ Local panels/ Barrier earth bus bars in trays/ conduits/ trenches as required.					
4596	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.650.10.1	At both ends of earth grid/ Instruments of GI wire (12 AWG) in trays and conduits as required excluding earth-pit preparation and electrode installation.	100	m		50	5000
4597	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.650.10.7	For earthing cable upto 50 mm² size with PVC insulation	100	m		400	40000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4598	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700	PIPING / TUBING / FABRICATION WORK					
4599	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.2	Fabrication and erection of SS Air lines and fittings including supply/ fabrication/ erection of supports, installation of distribution, pneumatic testing and painting of supports but exclusive of supply of pipe and fittings as per standard					
4600	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.2.1	For 1/2" Size	200	m		360	72000
4601	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.2.2	For size 1"	200	m		470	94000
4602	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.7	Erection of SS Air distribution manifold and fittings including supply/ fabrication/ erection of supports, pneumatic testing and painting of supports but exclusive of supply of SS Air distribution manifold and fittings					
4603	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.7.3	Installation of 12-way Air Manifold (1/2") as per Standard 7-52-1904	9	nos		4430	39870
4604	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.7.5	Installation of 6-way Air Manifold (1/2") as per Standard 7-52-1905	18	nos		2640	47520
4605	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.50	Tubing Hook-up of Control valves/ Pneumatic Transmitters etc. with air filter regulator / positioner / solenoid valves / Current to Pneumatic converters etc. as per Standards					
4606	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.50.18	7-52-1906 (Control Valve with positioner)	13	nos		1840	23920
4607	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.700.50.19	7-52-1902 (Control Valve with positioner with SOV)	27	nos		3030	81810
4608	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780	PWHT/ STRESS RELIEF - CARBON STEEL					
4609	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.10	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Gauges installations.					
4610	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		4220	21100
4611	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.30	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Pressure Instruments installations.					
4612	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.30.MH02	Installation standard 7-52-1202	5	nos		18440	92200
4613	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.50	Post-weld Heat Treatment (PWHT)/ Stress Relieving of all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
4614	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.780.50.MH02	Installation standard 7-52-1413	5	nos		36050	180250
4615	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785	RADIOGRAPHY - CARBON STEEL WELD JOINTS					
4616	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.10	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Gauges					
4617	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.10.1	Installation standard 7-52-0432/ 0433/1112/1113	5	nos		840	4200
4618	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.30	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Pressure Instruments installations					
4619	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.30.MH02	Installation standard 7-52-1202	5	nos		9290	46450
4620	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.50	Radiography conforming to the requirements of the Piping Class for all weld joints in impulse piping of Differential Pressure (Flow) Instruments					
4621	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.785.50.13	Installation standard 7-52-1413	5	nos		10140	50700
4622	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800	STRUCTURAL					
4623	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.20	Supply, Fabrication and erection of Galvanised Iron duct and its supports as per standard. Duct configurations include Duct Equal Tee, Duct Expander Tee, Duct Reducer Tee, Duct Offset Bend, Duct with Reducer, Vertical Plane Tee, Vertical Plane Elbow, Duct Bridge (jumpover), Sleeves.					
4624	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.20.1V1	Run of Duct 1200mm (W) X 400mm (H)	385	m		17480	6729800
4625	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.20.1V2	Run of Duct 400mm (W) X 200mm (H)	1501	m		6990	10491990
4626	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.20.1V5	Run of Duct 800mm (W) X 300mm (H)	3080	m		11660	35912800
4627	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.30	Supply, Fabrication, and Erection of Galvanised Iron angle/channel trays and its supports as per drawing.					
4628	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.30.1	Trays of 50 X 50 X 6mm angle	1600	m		640	1024000
4629	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.45	Supply, fabrication and installation of of Galvanized Iron ladder tray and its supports as per drawing including bends, tees and elbows, fabricated from 75 mm x 75 mm x 6 mm Galvanized Iron Angle with 50 mm (W) x 6 mm thick Galvanized Iron flat including supply and installation of supports and painting of supports as per specifications.					
4630	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.45.1	Run of ladder tray 600mm width	50	m		2320	116000
4631	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.71	Supply and Erection of prefabricated Hot dip Galvanized MS sheets perforated trays and its supports including tees, bends and elbows as per drawing.					
4632	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.71.1V1	Tray of 150mm (W) X 30mm (H)	1150	m		900	1035000
4633	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.71.1V2	Tray of 300mm (W) X 30mm (H)	3350	m		1340	4489000
4634	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.800.71.1V3	Tray of 60mm (W) X 20mm (H)	3020	m		400	1208000
4635	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802	CANOPY FOR INSTRUMENTS AND JUNCTION BOXES					
4636	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.20	Supply of Prefabricated FRP canopies along with mounting accessories for local instruments, Transmitters, Junction Box etc. for mounting on the stanchion and alignment as per standard 7-52-0105					
4637	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.20.1	FRP Canopy (All sides closed) - Field Instruments	111	nos		2870	318570
4638	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.20.3	FRP Canopy (All Side Closed) - Temperature Transmitter and Loop Powered Indicator	36	nos		2870	103320
4639	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.20.4	FRP Canopy For Junction Box - Front Side Open	64	nos		3590	229760
4640	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.20.6	FRP Canopy for RTD / Thermocouple	36	nos		2870	103320
4641	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.26	Erection of Prefabricated FRP canopies for local instruments, Transmitters, Junction Box etc. on the stanchion and alignment as per standard 7-52-0105					
4642	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.26.1	FRP Canopy (All sides closed) - Field Instruments	111	nos		680	75480
4643	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.26.3	FRP Canopy (All Side Closed) - Temperature Transmitter and Loop Powered Indicator	36	nos		680	24480
4644	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.26.4	FRP Canopy For Junction Box - Front Side Open	64	nos		800	51200
4645	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.802.26.6	FRP Canopy for RTD / Thermocouple	36	nos		680	24480
4646	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850	Instrumentation Works					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4647	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850.30	INSTALLATION OF PRE-FABRICATED HOOK-UP ASSEMBLY: Transportation of prefabricated hook-up assemblies from Owner's storage point to work site, connecting of First-joint of prefabricated hook-up on pipe/ equipment nozzles/ orifice assembly/ flow-meter and at pre-fabricated hook-ups assembly end, erection of supports, mounting of instrument stanchions (2" pipe) through pipe clamp/ Brackets (if required), including performing Radiography & PWHT wherever applicable as per the piping class but exclusive of supply pre-fabricated hook-up assembly, instrument stanchions, pipe clamps/ brackets. Prefabricated hook-up welding on pipe shall be of dissimilar material. Material of Pre-fabricated hook-ups shall be SS (316/316L/304/321).					
4648	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850.30.3	Flow assembly with 3/4" SW connection (without PWHT)	14	nos		1730	24220
4649	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850.30.4	Flow assembly with 3/4" SW connection (with PWHT)	5	nos		1950	9750
4650	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850.30.7	Pressure assembly with 1/2" SW connection (without PWHT)	61	nos		1730	105530
4651	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.850.30.8	Pressure assembly with 1/2" SW connection (with PWHT)	5	nos		1950	9750
4652	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900	GENERAL SITE WORK					
4653	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.10	Supply of Yoke supports for transmitters/ preamplifiers (wherever applicable) including supply, fabrication and erection of instrument yoke of all types and painting of yoke supports but exclusive of mounting of Instrument on supports.					
4654	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.10.1	2" Yoke supports as per standard 7-52-0101	210	nos		2720	571200
4655	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.12	Erection of 2" Yoke supports/ stanchions for Instruments but excluding supply and fabrication of Yoke support.					
4656	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.12.1	Erection of 2" Yoke supports for instruments excluding supply of Yoke	210	nos		1700	357000
4657	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.40	Identification of instrument items wherever required including supply of approved color of paint/ paints (Fluorescent), painting of tag number (approx. 25-50 mm high) on instrument item like transmitters, switches, level gauges, local indicators, control valves, on-off valves, pressure relief valves, self-actuated pressure control valves, junction boxes, local control panels, stanchions etc. as specified by Engineer-in-Charge.					
4658	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.900.40.1	Identification of instrument items	500	nos		350	175000
4659	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950	SITE ACTIVITIES BY MECHANICAL CONTRACTOR					
4660	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10	Transportation of all types of valves (Including Control Valves, Special Control Valves, PRDS, Control valves, On-Off/Shutdown valves, Self actuating valves) from Owner's storage points to contractor's stores/worksite and installation of valves for all rating including assembly of valves accessories like air bottles etc, if any, fixing of gaskets bolts/nuts wherever required and performing Positive Material Identification(PMI) using alloy analysers as per specification, drawings and directions of Engineer-in-Charge.					
4661	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V10	Inlet Valve size - 12" , Rating - 300#	9	nos		7290	65610
4662	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V11	Inlet Valve size - 1" , Rating - 300#	3	nos		870	2610
4663	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V12	Inlet Valve size - 1 1/2" , Rating - 300#	2	nos		950	1900
4664	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V13	Inlet Valve size - 3" , Rating - 300#	7	nos		1820	12740
4665	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V14	Inlet Valve size - 2" , Rating - 300#	4	nos		1040	4160
4666	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V15	Inlet Valve size - 4" , Rating - 300#	10	nos		2430	24300
4667	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V16	Inlet Valve size - 6" , Rating - 300#	22	nos		3650	80300
4668	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V17	Inlet Valve size - 8" , Rating - 300#	6	nos		4860	29160
4669	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V19	Inlet Valve size - 10" , Rating - 300#	4	nos		6080	24320
4670	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V23	Inlet Valve size - 2" , Rating - 600#	1	nos		1040	1040
4671	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V24	Inlet Valve size - 3" , Rating - 600#	1	nos		1820	1820
4672	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V30	Inlet Valve size - 14" , Rating - 300#	2	nos		9270	18540
4673	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V44	Inlet Valve size - 12" , Rating - 600#	7	nos		7290	51030
4674	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.10.1V45	Inlet Valve size - 6" , Rating - 600#	1	nos		3650	3650
4675	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11	Transportation of all types of Safety Valves, Pilot Operated Safety Valves, Breather valves from owner's storage point to contractor's store/worksite and installation of valves for all ratings including assembly of valves, accessories if any, at all locations and fixing of gaskets, bolts/nuts wherever required as per drawings, specifications and as per the directions of engineer-in-charge.					
4676	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V1	Inlet size - 1 1/2" , Rating - 150#	9	nos		920	8280
4677	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V3	Inlet size - 1" , Rating - 150#	34	nos		610	20740
4678	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V6	Inlet size - 4" , Rating - 150#	2	nos		2430	4860
4679	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V7	Inlet size - 6" , Rating - 150#	6	nos		3650	21900
4680	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V9	Inlet size - 1" , Rating - 300#	42	nos		610	25620
4681	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V11	Inlet size - 4" , Rating - 300#	2	nos		2430	4860
4682	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V13	Inlet size - 1" , Rating - 600#	18	nos		610	10980
4683	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V30	Inlet size - 6" , Rating - 600#	16	nos		3650	58400
4684	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V33	Inlet size - 12" , Rating - 150#	4	nos		7290	29160
4685	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.11.1V34	Inlet size - 10" , Rating - 150#	4	nos		6080	24320

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4686	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12	Cleaning, set pressure tests of pressure relief and thermal relief valves before installation, providing equipments, necessary test jig, instrument air, nitrogen cylinders, all consumables and loop testing including dropping/shifting of the PSV's/TSV's from the installed position(if required) to workshop for calibration/re-calibration/re-checking, etc., and reinstall back to original location including parts replacement, gasket, stud/bolts etc., re-fixing of the PSV's /TSV's including lapping (if required) but excludes flow calibration, calibration/test reports and excluding supply of valves					
4687	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V2	Inlet size - 1" , Rating - 150#	34	nos		1730	58820
4688	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V6	Inlet size - 1" , Rating - 300#	42	nos		1730	72660
4689	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V8	Inlet size - 4" , Rating - 300#	2	nos		2580	5160
4690	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V10	Inlet size - 1" , Rating - 600#	18	nos		1730	31140
4691	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V25	Inlet size - 6" , Rating - 150#	6	nos		3460	20760
4692	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.12.1V29	Inlet size - 6" , Rating - 600#	16	nos		3460	55360
4693	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13	Impulse line painting (uninsulated) as per painting specification for project					
4694	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13.1V1	Instrumentation impulse line of size 1/2" for temp. (-)14 to 80 degC	100	m		40	4000
4695	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13.1V2	Instrumentation impulse line of size 1/2" for temp. up to 120 degC	500	m		40	20000
4696	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13.1V3	Instrumentation impulse line of size 1/2" for temp. 120 to 200 degC	100	m		40	4000
4697	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13.1V4	Instrumentation impulse line of size 1/2" for temp. above 200 degC	100	m		40	4000
4698	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.13.1V10	Instrumentation impulse line of size 3/4" for temp. 120 to 200 degC	100	m		60	6000
4699	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17	Transportation of all line mounted flow instruments such as Coriolis Mass Flow Meter, magnetic flow meter, ultrasonic flow meter, variable area flow meter, vortex flow meter, venturi flow meter, flow nozzle, integral orifice flow meter, wedge flow meter from Owner's storage points to contractor's stores/worksite and installation of these Flow Meters for all rating, fixing of gaskets bolts/nuts wherever required as per specification, drawings and directions of Engineer-in-Charge.					
4700	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17.MH01	Inlet size - 18" , Rating - 150#	1	nos		8120	8120
4701	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17.1V1	Inlet Size - 1" , Rating - 300#	1	nos		1240	1240
4702	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17.1V8	Inlet Size - 12" , Rating - 300#	1	nos		5390	5390
4703	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17.1V36	Inlet Size - 6" , Rating - 150#	1	nos		2510	2510
4704	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.17.1V39	Inlet Size - 10" , Rating - 150#	1	nos		4740	4740
4705	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.19	Transportation of all types of Flame Arrestor from owner's storage point to contractor's store/worksite and installation of Flame Arrestor for all ratings including assembly, accessories if any, at all locations and fixing of gaskets, bolts/nuts wherever required as per drawings, specifications and as per the directions of engineer-in-charge.					
4706	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.19.MH01	Inlet size - 3" , Rating - 150#	9	nos		1710	15390
4707	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.19.1V3	Inlet size - 2" , Rating - 150#	2	nos		1530	3060
4708	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.19.MH02	Inlet size - 8" , Rating - 150#	4	nos		3400	13600
4709	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.21	Transportation of all types of Emergency vents from owner's storage point to contractor's store/worksite and installation of Emergency vents for all ratings including assembly, accessories if any, at all locations and fixing of gaskets, bolts/nuts wherever required as per drawings, specifications and as per the directions of engineer-in-charge.					
4710	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.21.MH01	Inlet size - 10" , Rating - 150#	5	nos		6490	32450
4711	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.21.1V3	Inlet size - 24" , Rating - 150#	9	nos		16760	150840
4712	B	B957-999-16-51-PK-SOR-9501-B-1M	01II.950.21.MH02	Inlet size - 12" , Rating - 150#	5	nos		7420	37100
4713	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ	EQUIPMENT - PACKAGE					
4714	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.1	INSTALLATION OF FREE ISSUE EQUIPMENT: Handling and transportation of Equipment from Owner's storage point to work site/contractor's stores. Assembly of subassemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (incldluing supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of inter- connecting piping including some amount of cutting and welding, wherever required. Purging the line with air/gas, installation of insulation in all respects wherever applicable on equipments and piping as per Vendor drawings, application of touch-up paint (if required) after erection and assembly at site, providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below :					
4715	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.1.7	Loading Arm(Manual)	11	MT		32930	362230

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4716	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.3	INSTALLATION OF FIELD ASSEMBLED FREE ISSUE PACKAGES COMPRISING OF KNOCKED DOWN EQUIPMENT: Handling and transportation of Package consisting of single or multiple skids including interconnecting piping between skids from Owner's storage point to work site/contractor's stores. Assembly of sub-assemblies, placing the equipment on foundations/structures, levelling, aligning, fixing of foundation bolts, providing (including supply) packing/shim plates, chipping and dressing of foundations, grouting (including supply and applications of grout material), cleaning and flushing of equipment with water, draining and drying with compressed air, erection of vendor's supplied loose inter- connecting piping including instruments, piping accessories and supports, wherever required. Purging the line with air/gas as per the instruction of Package supplier (wherever applicable), installation of insulation in all respects wherever applicable on equipments and piping as per Vendor drawings, application of touch-up paint (if required) after erection and assembly at site, providing manpower for carrying out pre-commissioning, commissioning and testing under the supervision guidance of Manufacturer's/Owner's personnel and rectifying defects, if any and completing the work in all respects as per drawing(s), specifications, scope of work and instructions of engineer in charge for each equipment including drives and accessories listed below : NOTE (1): Erection of Vendor's supplied loose interconnecting piping is already covered above and the indicated weight of respective package mentioned below includes the same. NOTE (2): Contractor's scope shall also cover field welding which includes fabrication & hydro/pneumatic testing, DPT/MPT/NDT testing, etc. of vendor's supplied loose interconnecting piping(pre-fabricated spools/commercial length), wherever required. Same shall be payable extra at the rate provided against respective piping SOR items.					
4717	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.3.48	Vapor Recovery System	390	MT		52000	20280000
4718	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7	Chain Pulley Block					
4719	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1	Supply of Geared Trolley Mounted Chain Pulley Block					
4720	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1	Procurement & delivery of Chain Pulley Block (CPB) with its trolley, lift up to 8 m and average 8 m distance from monorail to operating floor irrespective of monorail beam size. For upward revision of height of lift and (or) operating floor distance below monorail beyond the aforesaid limit, payment shall be adjusted based on respective quoted rate for per meter increase in the height of lift and operating floor distance below monorail.					
4721	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V2	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 10 MT	1	nos		480910	480910
4722	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V3	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 3 MT	2	nos		283250	566500
4723	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V4	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 1 MT	2	nos		189760	379520
4724	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V5	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 2 MT	2	nos		236900	473800
4725	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V6	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 5 MT	2	nos		309520	619040
4726	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V7	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 7.5 MT	1	nos		381400	381400
4727	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.1.1.1V9	Spark resistant Chain Pulley Block with Geared Trolley suitable for Hazardous area of capacity 15 MT	1	nos		607270	607270
4728	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2	Supply of Hook Mounted Chain Pulley Block (Without Geared Trolley)					
4729	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2.1	Procurement & delivery of Chain Pulley Block (CPB),suitable for lift upto 8 m and average 8 m distance from suspension hook to operating floor. Also refer Scope of work /Job Specification attached with the tender. For upward revision of height of lift and (or) operating floor distance below suspension hook beyond the aforesaid limit, payment shall be adjusted based on respective quoted rate for per meter increase in height of lift and operating floor distance below monorail.					
4730	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2.1.1V2	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 1 MT	1	nos		46350	46350
4731	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2.1.1V4	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 2 MT	1	nos		93220	93220
4732	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2.1.1V5	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 3 MT	1	nos		139820	139820
4733	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.2.1.1V6	Spark resistant Chain Pulley Block without geared trolley suitable for hazardous area of capacity 5 MT	1	nos		233040	233040
4734	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.4	Installation of Geared Trolley Mounted Chain Pulley Block / Geared Trolley (of Chain Pulley Block)					
4735	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.4.1	Transportation of Equipment from Owner's store/Contractor's store to work site. Assembly of subassemblies, placing the equipment on monorail, levelling, aligning, fixing of bolts, providing manpower for carrying out trial and start up runs and testing under the supervision guidance of manufacturer/clients- personnel and rectifying defects of any and completing the work in all respects as per drawing, specifications and instructions of engineer in charge for each equipment including accessories. Also refer Scope of work /Job specification attached with the tender.					
4736	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.4.1.1	Chain Pulley Block Capacity- Upto 10 MT	10	nos		48090	480900
4737	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.4.1.2	Chain Pulley Block Capacity- from 15 MT to 25 MT	1	nos		97160	97160
4738	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.5	Installation of Hook Mounted Chain Pulley Block					
4739	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.5.1	Transportation of Equipment from Owner's store/Contractor's store to work site. Assembly of subassemblies, placing the equipment on hook, providing manpower for carrying out trial and start up runs and testing under the supervision guidance of manufacturer/clients- personnel and rectifying defects of any and completing the work in all respects as per drawing, specifications and instructions of engineer in charge for each equipment including accessories. Also refer Scope of work /Job specification attached with the tender.					
4740	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.5.1.1	Chain Pulley Block Capacity- Upto 10 MT	4	nos		23310	93240
4741	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.6	For supply: Unit Rate (addition) per meter increase in height of lift(due to increase in load chain length etc.) for Chain Pulley Block as per scope of work/Job specification defined in the tender.					
4742	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.6.1	Chain Pulley block capacity upto10 MT	5	per metre length		2290	11450

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4743	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.6.2	Chain Pulley Block capacity from 15 MT to 25 MT	5	per metre length		3300	16500
4744	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.7	For supply: Unit Rate (addition) per meter increase in distance from monorail/point of suspension to operating floor(due to increase in hand chain length etc.) for Chain Pulley Block as per scope of work/Job specification defined in the tender.					
4745	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.7.1	Chain Pulley Block Capacity upto 10 MT	10	per metre length		650	6500
4746	B	B957-999-80-42-PK-SOR-9501-B-0M	01QQ.7.7.2	Chain Pulley Block Capacity from 15 MT to 25 MT	10	per metre length		910	9100
4747	B	B957-999-80-42-PK-SOR-9501-B-0M	01RR	EQUIPMENT - ROTATING					
4748	B	B957-999-80-42-PK-SOR-9501-B-0M	01RR.1	Handling and transportation of Rotating Equipment & miscellaneous items of equipment package from Owner's storage points to work site / contractor's stores, assembly of sub-assemblies, field assembly (as applicable) placing the equipment on foundations, (including some amount of cutting, welding & field joints wherever required), levelling, aligning, fixation of foundation bolts, providing (including supply) packing / shim plates (as applicable), including chipping & dressing of foundations, grouting (including supply and application of grout material, equipment base frame filling as per vendor recommendation with specified grout), cleaning and flushing, draining and drying, purging of lines, and providing manpower and tools / equipment for NDT, testing, carrying out trial and start-up runs and testing under supervision of manufacture's / customer personnel, rectifying defects (if any), insulation (as applicable), precommissioning and commissioning (as applicable) and completing the work in all respects as per drawings, job specifications / scope of work and instructions of Engineer-in-charge for each equipment including drivers and accessories, as listed below. NOTE: Scope also includes erection, fabrication, insulation (as applicable), welding & field joints wherever required, installation & NDT of vendor supplied prefabricated spools / commercial length between various skids of an equipment package (payable at the rate provided against piping SOR items).					
4749	B	B957-999-80-42-PK-SOR-9501-B-0M	01RR.1.MF01	Initial fill of lubricants, sealing fluid & other consumables etc. required for startup and commissioning of Free Issue Item as per document no. B957-999-80-42-SOW-9501_Sec. C	1050	Litre		310	325500
4750	B	B957-999-80-42-PK-SOR-9501-B-0M	01RR.1.1	Pump Packages (all types) with drivers, auxiliaries and accessories.					
4751	B	B957-999-80-42-PK-SOR-9501-B-0M	01RR.1.1.1	All Types of Pumps (Electric Motor Driven) along with driver, auxiliaries and accessories (Single Skid).	164.9	MT		36890	6083161
4752	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV	EQUIPMENT - STATIC					
4753	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30	EQUIPMENT ERECTION					
4754	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.1	EQUIPMENT ERECTION: Transportation of reactors, columns, vessels, silencers, heat exchangers (shell and tube, plate fin, plate) and electric heater etc. from owner's storage point to work site, assembly of parts, subassemblies, erection at all elevations, aligning, verticality checking, grouting, tightening of foundation bolts, welding of washer on anchor chairs, erection of wooden pillow for cold equipments, stacking of multi-tier exchanger(which are stored in unstacked condition), arranging hooks for test ring/ test flanges in heat exchangers, installation of demister, internal gratings, distributor, pipe davit, installation of mixer/agitator, cleaning and flushing by water, draining, drying by compressed air, arranging all tools, tackles, machinery, consumables, transportation equipment, erection equipment, instruments, labour, ancillary, etc. to complete the work in all respects as per drawings, equipment detail, specifications and instructions of the Engineer-in-Charge.					
4755	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.1.1	Equipment weighing less than 500 MT but 100 MT and above	450	MT		58670	26401500
4756	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.1.4	Equipment weighing less than 30 MT but 10 MT and above	15	MT		39730	595950
4757	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3	HYDROTESTING OF EQUIPMENT					
4758	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3.2	HYDROSTATIC TESTING OF EXCHANGERS (shell and tube): Hydrostatic testing of exchangers single tier or multitier including dismantling and reassembling of piping connections wherever required, providing blinds and gaskets on nozzles, piping, arranging water hoses, gauges, valves, test pumps and all other temporary arrangements, labour and materials, drying by hot compressed air as per specifications and instructions of Engineer-in-Charge. In case, if leakage is found in gaskets and gaskets are replaced, then re-hydrotest to be done with new gasket after reassembly. (AS PER ERECTION SPECIFICATION ENCLOSED)					
4759	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3.2.1	Hydrotesting of shell side					
4760	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3.2.1.1	upto 20m3	1	nos		39730	39730
4761	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3.2.2	Hydrotesting of tube side					
4762	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.3.2.2.1	upto 20m3	1	nos		39730	39730
4763	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.7	LETTERING AND STENCILING: Surface preparation, supply and application of primer and paint on insulated and uninsulated equipment for lettering, stenciling on vessels, columns, drums, for the purposes of identification (Equipment Name, Equipment Number & Service Description) as per applicable painting specification enclosed elsewhere in the tender document, arranging scaffolding for all heights, labour, materials, tools, tackles, supervision etc. to complete the work as per specifications and instructions of Engineer-in- Charge.	500	Per Letter		210	105000
4764	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.12	ERECTION OF BURIED EQUIPMENT : Transportation of vessels from Owner's storage point to worksite, repair/ touch up of finish paint, arrangement of all accessories, equipments, labour etc., placing/erection of vessel in trenches/pits including assembly of parts, subassemblies, aligning, verticality checking, grouting, tightening of foundation bolts, arranging all tools, tackles, machinery, consumables etc to complete the work in all respects as per drawings, equipment detail, specifications and instructions of the Engineer-in-Charge.					
4765	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.12.4	Equipment weighing less than 30 MT but 10 MT and Above	90	MT		34280	3085200

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4766	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13	WELDING & NDT OF CUT NOZZLES / SUMP / BOOT OF BURRIED VESSELS: Assembly of cut nozzles/Sump/Boot(as shown in Respective Engg. Data Sheet), vertically checking, alignment, Welding of cut nozzles , NDT such as 100% radiography ,UT , surface preparation of the weld seam portion, application of primer, painting, arranging all tools and tackles, machinery. Consumables, transportation/handling of equipment, labour etc to complete the work in all respects as per drawings & instruction of Engineer-in charge.					
4767	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.4	MOC : Carbon Steel ,Nozzle size : 6"	9	nos		7480	67320
4768	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.10	MOC : Carbon Steel ,Nozzle size : 18"	2	nos		22430	44860
4769	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.11	MOC : Carbon Steel ,Nozzle size : 20"	1	nos		24930	24930
4770	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.12	MOC : Carbon Steel ,Nozzle size : 24"	10	nos		29910	299100
4771	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.13	MOC : Carbon Steel ,Nozzle size : 28"	1	nos		34900	34900
4772	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.13.14	MOC : Carbon Steel ,Nozzle size : 30"	1	nos		37390	37390
4773	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15	CHEMICAL CLEANING OF HEAT EXCHANGER/HEATER: Procurement of all materials, carrying out chemical cleaning / pre-cleaning / degreasing / passivation (as applicable) of equipment, arranging labour, materials, tools and tackles, consumables, supervision etc. required to complete the work in all respects as per job specification attached with the tender document and directions of Engineer-in-charge. Refer mechanical data sheet/Scope of Supply/Work attached with the tender.					
4774	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.1	Chemical Cleaning (Shell Side)					
4775	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.1.1	upto 20m3	1	nos		412000	412000
4776	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.1.2	above 20m3 to 50m3	1	nos		1030000	1030000
4777	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.5	Chemical Cleaning (Tube Side)					
4778	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.5.1	upto 20m3	1	nos		412000	412000
4779	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.30.15.5.2	above 20m3 to 50m3	1	nos		1030000	1030000
4780	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40	EQUIPMENT INSULATION					
4781	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40.1	HOT INSULATION: Providing thermal insulation including supply of all insulating and ancillary material, weather protective covering, consumables and other necessary materials, testing of the material as required including transportation of the materials to work sites, applying insulation on surfaces as specified, including all preparatory works thereon, all binding, tying, lacing, stitching and/or otherwise securing, providing vapour barrier, finishing with plain/corrugated sheet cladding or as specified, providing bolts, rivets, self tapping screws wherever specified, providing inspection windows etc., arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc., labour and supervision and completing the work in all respect at all heights as per drawings, specifications and instructions of Engineer-in-Charge.					
4782	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40.1.4	Shells and heads of horizontal vessels, columns, reactors, exchangers, silencers etc and heads of above mentioned vertical equipments. Surface material SS. Insulation type: IH &IT (Rockwool).					
4783	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40.1.4.7	Insulation Thickness: 65mm	30	m²		7900	237000
4784	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40.2	COLD INSULATION: Providing cold insulation including supply of all insulating and anciliary material, protective covering, consumables and other necessary materials, testing of the material as required including transportation of the materials to work sites, applying insulation on surfaces as specified, including all preparatory works thereon, all binding, tying, lacing, stitching and/or otherwise securing, providing vapour barrier, finishing with plain/corrugated sheet cladding or as specified, providing bolts, rivets, providing vapour stop etc. arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc. labour and supervision and completing the work in all respect at all heights as per drawings, specifications and instructions of Engineer-in-Charge.					
4785	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.40.2.MF01	Shells and heads of horizontal vessels, columns, reactors, exchangers, silencers etc and heads of above mentioned vertical equipments. Surface material SS. Insulation type: Inner layer : polyisocyanurate (PIR) insulation (ASTM C591, Grade-2, Type-II), 140 mm Outer layer: Ic (Cellular glass, ASTM C 552, Grade 6, Type-II), 50 mm	30	m²		9630	288900
4786	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50	EQUIPMENT PAINTING					
4787	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF01	Supply and application touch up paint on Stainless Steel vessels, columns, reactors, silencers, exchangers and other equipment, including rubdown and touch up of shop primer (primer as per applicable specification) wherever required, as per attached specification, providing scaffolding for all heights, labour, materials, tools and tackles, consumables and supervision etc. to complete the work in all respect as per specifications, drawings, equipment details for painting and direction of Engineer in-Charge. The surface area is as per respective temperature ranges given below as per applicable specification. Note: Touch up paint shall be done by Mechanical contractor, Surface preparation and first coat of primer application and finish paint shall be provided by equipment supplier.					
4788	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF01.01	For Shell Side of Item No: 500-EE-AT-004: SS304L Design Temperature:240 Deg C Primer: SSPC-SP-16; (15-25µ surface profile), 1 coat of F-16 @125 µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01	5	m²		1190	5950
4789	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF01.02	For Tube side: Item No: 500-EE-AT-004, MOC SS304L Design Temeparture: -110/65 Surface Preparation & Primer: SSPC-SP-10 for CS, LTCS & Alloy Steel, SSPC-SP-16 for SS ; (15-25µ surface profile), 1 coat of F-16 @125µ DFT/coat. Finish Paint: 1 coats of F-16 @125µ DFT/coat. Total DFT: 250 microns. Remarks: Refer job specification for surface preparation and painting Doc No: B957- 000-06-42-PLS-01.	5	m²		1190	5950

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4790	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF02	Supply and application of touch up paint for carbon steel vessels , rubdown and touch up of shop primer/finish paint (primer/finish paint as per applicable specification) wherever required as per attached specification, providing scaffolding for all heights, labour, material, tools and tackles, consumables, supervision etc. to complete the work in all respect as per specifications, drawings, equipment details for painting and direction of Engineer in-Charge for all type of uninsulated equipment. The surface area is as per respective temperature ranges given below as per applicable specification. Note: Only Touch Up Paint shall be provided by Mechanical contractor, Surface preparation and primer application and finish paint shall be provided by equipment supplier.					
4791	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF02.01	UNDERGROUND VESSELS: TAG NO: 500-VV-HI-001, 500-VV-HI-007, 500-VV-HI-008 Primer: SSPC-SP -10, 1 coat of F-17 primer @400 µ DFT/ coat Finish Paint: 1 coat of F-17 @ 400µ DFT/ coat TOTAL DFT - 800 MICRONS Remarks: Refer Job specification for surface preparation and painting Doc No: B957-000-06-42-PLS-01	25	m²		990	24750
4792	B	B957-999-80-42-PK-SOR-9501-B-0M	01VV.50.MF02.02	ISOPENTANE BULLET; Item Tag No: 510-TT-00-003A/B. Design Temperature: 55 Deg C. Primer: SSPC-SP -10; 1 coat of F-9 primer @ 65-75µ DFT/ coat + 1 coat of P-6 @40µ DFT/ coat. Intermediate paint: 1 coat of F-6B@100µ DFT/ coat. Finish Paint: 1 coat of F-2 @40µ DFT/ coat. TOTAL DFT - 245-255 MICRONS Remarks: Refer job specifcation for surface preparation and protective coating Doc No: B957-000-06-42-PLS-01	50	m²		620	31000
4793	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS	STRUCTURAL					
4794	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1	EARTH WORK (REFER SPECIFICATION NO. 6-68-0003)					
4795	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.1	Earthwork excavation in soil					
4796	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.1.1	Earth work in EXCAVATION below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	2300	m³		300	690000
4797	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.1.2	Earth work in EXCAVATION below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth beyond 1.5m and upto and inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	50	m³		350	17500
4798	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.2	Earthwork excavation in soft rock					
4799	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.2.1	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	100	m³		720	72000
4800	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.2.2	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 1.5m and upto & inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	20	m³		880	17600
4801	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.4	Earthwork excavation by controlled blasting (Explosive/ Non-explosive)					
4802	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.4.11	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Hard Rocks, for a depth of 1.5m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	1	m³		2290	2290
4803	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.4.12	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Hard Rocks, for a depth beyond 1.5m and upto & inclusive of 3.0m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	1	m³		2590	2590

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4804	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.4.MD1411	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Soft Rocks, for a depth of 1.5m including all related work for non explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holeswith non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area,chiselling & cutting to required levels, dressing & trimmingof sides, levelling & grading of bottoms, dewatering of accumulated water from anysource and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	50	cum		2080	104000
4805	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.4.MD1412	Earthwork in EXCAVATION below ground level for all kinds of works by Non-Explosive Blasting methods in Soft Rocks, for a depth beyond 1.5m and upto & inclusive of 3.0m including all related work for non-explosive blasting such as drilling, supplying, storage, mixing & filling of drilled holes with non-explosive demolition agents/ blasting chemicals making necessary safety measures around the area, chiselling & cutting to required levels, dressing & trimming of sides, levelling & grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works & disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. as directed including providing temporary support to existing structures, service lines like water pipes, sewage pipes, electric overhead and underground cable etc. all complete.	10	cum		2360	23600
4806	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.5	Earthwork excavation by chiselling					
4807	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.5.1	Earth work in EXCAVATION below ground level for all kinds of works in HARD ROCKS for a depth upto 1.5m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	1	m^3		1820	1820
4808	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.5.2	Earth work in EXCAVATION below ground level for all kinds of works in HARD ROCKS for a depth beyond 1.5m and upto & inclusive of 3.0m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	1	m^3		2020	2020
4809	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.5.MD1401	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCKS for a depth upto 1.5m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	850	cum		1610	1368500
4810	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.5.MD1402	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCKS for a depth beyond 1.5m and upto & inclusive of 3.0m by CHISELLING (pneumatic or manual), wedging or any other agreed methods (where blasting is prohibited for any reason or as decided) including all related works, all equipments required for chiselling, and cutting upto required levels, dressing and trimming of sides, levelling and grading of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal of spoils to spoil heaps and stacking of usable excavated materials within a lead of 100m etc. all complete as directed including providing temporary supports to existing service lines like waterpipes, sewage pipes, electric overhead and underground cables etc. all complete.	25	cum		1770	44250
4811	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.6	SHORING AND STRUTTING					
4812	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.6.1	Providing and installing approved type of "SHORING AND STRUTTING" by open timbering method for all depths to retain earth including dismantling and removal of the same etc. from site after completion of work etc. all complete as directed.	50	m^2		400	20000
4813	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.6.2	Providing and installing approved type of "SHORING AND STRUTTING" by close timbering method for all depths to retain earth including dismantling and removal of the same etc. from site after completion of work etc. all complete as directed.	25	m^2		580	14500
4814	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7	Backfilling after execution of work					
4815	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.1	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps within a LEAD OF 100M, including re- excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/ mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	1700	m^3		270	459000
4816	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.2	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps beyond a LEAD OF 100M AND UPTO & INCLUSIVE OF 500M including re-excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	300	m^3		320	96000
4817	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.3	BACKFILLING after execution of the WORK to proper grade and level with selected materials from available excavated soil from spoil heaps beyond a LEAD OF 500M AND UPTO & INCLUSIVE OF 1KM including re-excavating the deposited soil excavated earlier, breaking clods, laying at all depths and heights in layers of thickness not exceeding 15 Cms. watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% laboratory maximum dry density, dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	100	m^3		340	34000

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4818	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.MD1401	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock beyond a LEAD OF 3KM ANDUPTO & INCLUSIVE OF 5KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	10	cum		490	4900
4819	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.MD1402	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock beyond a LEAD OF 1KM AND UPTO & INCLUSIVE OF 3KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	25	cum		450	11250
4820	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.7.MD1403	BACKFILLING after execution of the WORK to proper grade and level from available crushed rock within a LEAD OF 1KM laying at all depths and heights in layers of 150mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density dressing, trimming etc. in foundations, plinths, trenches, pits etc. all complete.	25	cum		410	10250
4821	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.9	Earthwork Filling by excavation					
4822	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.9.4	EARTHWORK IN FILLING by excavating the earth from BORROW AREAS arranged by CONTRACTOR for all leads, transporting the earth from borrow area including cleaning & stripping the earth at borrow areas, breaking clods, loading, unloading and laying at all depths and heights in layers of thickness not exceeding 15 cms., watering, rolling and ramming by manual methods/mechanical compactors to achieve 90% of the maximum laboratory dry density, dressing, trimming, levelling the top surface etc. in foundations, plinths, trenches etc. all complete.	125	m^3		600	75000
4823	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.10	Transporting & Disposing the SURPLUS EARTH AND DEBRIS					
4824	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.10.1	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 100M AND UPTO 1KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	125	m^3		220	27500
4825	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.10.2	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 1.0KM AND UPTO & INCLUSIVE OF 3.0KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	175	m^3		240	42000
4826	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.10.3	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 3.0KM AND UPTO & INCLUSIVE OF 5.0KM including re-excavating the deposited soil excavated earlier, transportation, loading, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids).	25	m^3		270	6750
4827	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.10.5	"Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction areas to areas ANYWHERE OUTSIDE THE PLANT BOUNDARY, including re-excavating the deposited soil excavated earlier, loading, transportation, unloading, laying at all depths and heights, stacking, levelling and dressing both the area (viz. from where the earth is transported and where it is deposited) to required levels and slopes complete with all lifts as directed. For carting on the basis of truck measurements (volume of truck reduced by 30% for voids). DISPOSAL AREAS OUTSIDE PLANT BOUNDARY TO BE ARRANGED BY THE CONTRACTOR. Royalty as applicable for disposal outside plant limits to be borne by the Contractor. "	25	m^3		340	8500
4828	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.11	Transportation of ROCK material					
4829	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.11.1	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 BEYOND INITIAL LEAD OF 100M AND UPTO 1KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	250	m^3		320	80000
4830	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.11.2	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 beyond initial LEAD OF 1.0KM AND UPTO & INCLUSIVE OF 3.0KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	700	m^3		340	238000
4831	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.11.3	Transportation of ROCK material coming out of operation of item Nos. 01CS.1.2 to 01CS.1.5 beyond initial LEAD OF 3.0KM AND UPTO & INCLUSIVE OF 5.0KM to the area of disposal including loading, unloading, laying at all depths and heights, stacking, spreading, levelling at an area of disposal as directed. For carting on the basis of Truck Measurements (volume of truck reduced by 50% for voids).	100	m^3		380	38000
4832	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.14	Earthwork Manual Excavation in SOIL					
4833	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.14.1	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	10	m^3		690	6900
4834	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.14.2	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in ALL TYPES OF SOILS EXCEPT SOFT ROCK AND HARD ROCK as classified in specification for a depth beyond 1.5m and upto and inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	5	m^3		790	3950

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4835	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.15	Earthwork Manual Excavation in SOFT ROCK					
4836	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.15.1	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	10	m^3		1630	16300
4837	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.15.2	Earth work in EXCAVATION BY MANUAL MEANS below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 1.5m and upto & inclusive of 3.0m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete, but excluding shoring and strutting.	5	m^3		1820	9100
4838	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.16	TRIAL PIT in Soil					
4839	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.16.1	Excavation of TRIAL PITS by Manual Means for determining the underground facilities in all type of soils for a depth upto 1.5m including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes (if required), disposal or stacking of excavated material within a lead of 100m, dewatering of accumulated water from any source, keeping the surface dry for subsequent works, barricading the area, preparing location & depth wise record of underground facilities and restoration of trial pits by excavated earth to original condition by compacting/ ramming the soil, etc. all complete as directed by Engineer-in-Charge including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables, etc., but excluding shoring and strutting.	10	cum		670	6700
4840	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.1.16.2	Excavation of TRIAL PITS by Manual Means for determining the underground facilities in all type of soils for a depth beyond 1.5m and upto 3.0m, including removal of vegetation, shrubs and debris, cutting and dressing of sides in slopes (if required), disposal or stacking of excavated material within a lead of 100m, dewatering of accumulated water from any source, keeping the surface dry for subsequent works, barricading the area, preparing location & depth wise record of underground facilities and restoration of trial pits by excavated earth to original condition by compacting/ ramming the soil, etc. all complete as directed by Engineer-in-Charge including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables, etc., but excluding shoring and strutting.	5	cum		770	3850
4841	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2	PLAIN & REINFORCED CEMENT CONCRETE: (REFER SPECIFICATION NO. 6-68-0004)					
4842	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.17	PCC - Non FIM Items					
4843	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.17.1	Providing and laying PLAIN CEMENT CONCRETE for all depths below and upto plinth level in foundations, drains, fillings, non-suspended floors, pavements & ramps or any other works etc. including shuttering, tamping, ramming, vibrating, curing etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed all complete for concrete of nominal mix 1:5:10 by mass (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregates/Gravels) with 40mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	45	m^3		6750	303750
4844	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.17.5	Providing and laying PLAIN CEMENT CONCRETE of nominal mix 1:3:6 by mass (1 Cement : 3 Sand : 6 Crushed Stone Aggregates) with 10mm and down size graded crushed stone aggregates below and upto plinth level as SCREED in trenches, floor slabs, sumps, channels, drains etc. for all depths including shuttering, tamping, curing etc. as specified in any shape, level, thickness, position and finishing the top surface smooth etc. all complete as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		7370	14740
4845	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.17.8	Providing and laying PLAIN CEMENT CONCRETE for all depths below and upto plinth level in foundations, drains, fillings, non-suspended floors, pavements & ramps or any other works etc. including shuttering, tamping, ramming, vibrating, curing, etc. all as specified in any shape, position, thickness and finishing the top surface rough or smooth as specified and directed all complete for concrete grade M20 with 20mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	70	m^3		8860	620200
4846	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.18	RCC Substrutures - Non FIM Items					
4847	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.18.16	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUB-STRUCTURE e.g. foundations, raft, beams, slabs, pile caps, retaining walls, dyke walls, jambs, counterforts, buttresses, pedestals, pipe sleepers, columns, suspended floors, staircases, landings, steps, brackets etc., including equipment/ machine foundations & pedestals viz. compressors, ID & FD fans, pumps, generators, crushers, mills, etc., (including single pour concreting as specified on the drawing), applying cement wash on concrete surface (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering, etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING & SPECIFIED ADMIXTURES) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	550	m^3		9740	5357000
4848	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.18.21	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUB-STRUCTURE e.g. trenches, culverts, manholes, pipe encasement, catchpits, drains, pits, etc., applying cement wash on concrete surface (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering, etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING & SPECIFIED ADMIXTURES) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		10230	20460
4849	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.19	RCC Superstructures - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4850	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.19.16	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUPER STRUCTURE in suspended floors, slabs, beams, columns, walls including counterforts, staircases, landings, steps, facias, fins, mouldings, gutters, shelves, window sills, canopies, lintels, girders, ducts, brackets, chajjas with drip moulds, pedestals, posts, struts, equipment/ machine foundations, ramps etc. (including single pour concreting as specified on the drawing), providing cement wash (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING AND SPECIFIED ADMIXTURES) FOR ALL HEIGHTS UPTO & INCLUSIVE OF 20 m ABOVE PLINTH LEVEL in any shape, position, thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		10640	21280
4851	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.19.21	Providing and laying REINFORCED CEMENT CONCRETE OF M-25 GRADE with 20 mm and down size graded crushed stone aggregates/ gravel in SUPER STRUCTURE in suspended floors, slabs, beams, columns, walls including counterforts, staircases, landings, steps, facias, fins, mouldings, gutters, shelves, window sills, canopies, lintels, girders, ducts, brackets, chajjas with drip moulds, pedestals, posts, struts, equipment/ machine foundations, ramps etc. (including single pour concreting as specified on the drawing), providing cement wash (wherever no other surface application is specified), providing pockets, openings, recesses, chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT, SHUTTERING AND SPECIFIED ADMIXTURES) FOR ALL HEIGHTS MORE THAN 20 m ABOVE PLINTH LEVEL in any shape, position, thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		11700	11700
4852	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.20	RCC Flooring - Non FIM Items					
4853	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.20.2	Providing and laying REINFORCED CEMENT CONCRETE OF M-20 GRADE with 20mm and down size graded crushed stone aggregates / gravel in NON-SUSPENDED slabs / pavement slabs including pedestals, ramps etc. leaving pockets, laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough or smooth, including cost of admixtures if used, providing pockets, openings, recesses, chamfering etc., wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (EXCLUDING THE COST OF REINFORCEMENT AND SHUTTERING) for all depths below and upto plinth level in any shape, position and thickness etc. all complete as specified, shown and directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m^3		8290	16580
4854	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22	Precast Elements - Non FIM Items					
4855	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.4	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit upto and inclusive of 500 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		19430	19430
4856	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.5	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit beyond 500 kg and upto and inclusive of 1000 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		19480	19480
4857	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.6	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as columns, beams, cover slabs, lintels, louvers, fins, shelves etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/gravel, each unit beyond 1000 kg and upto and inclusive of 2000 kg. for all leads, levels, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, finishing the top surface with cement mortar 1:3 (1 Cement : 3 Sand) to give a smooth and even surface, or non skid finish as specified, providing lifting hooks, metal inserts, making holes pockets, (ONLY M.S. INSERTS TO BE MEASURED & PAID SEPARATELY) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (1Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete (EXCLUDING THE COST OF REINFORCEMENT) and as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m^3		19630	19630
4858	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.MD1427	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit upto and inclusive of 1000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19480	19480

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4859	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.MD1428	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit beyond 1000 kg and upto and inclusive of 3000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19790	19790
4860	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.22.MD1429	Manufacturing, transporting, supplying and erecting in position Reinforced Cement Concrete PRECAST ELEMENTS such as manholes, catch-basins, pits, pipe sleepers, box-culverts, drains, trenches, etc. of M-25 grade with 20mm and down size graded crushed stone aggregates/ gravel, each unit beyond 3000 kg and upto and inclusive of 5000 kg. for all leads, levels below plinth, shapes and thickness including all moulds, shuttering and centering, vibrating, tamping, curing, chamfering wherever required, providing lifting hooks, metal inserts, making holes, pockets, (only M.S. inserts to be measured & paid separately) transporting to site, erecting, levelling, aligning and fixing in position with cement mortar 1:3 (Cement : 3 Coarse Sand), breaking bricks and/ or concrete surfaces and making good the same etc. all complete (excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.	1	cum		19940	19940
4861	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.23	HYD Bars / MS Bars - Non FIM Items					
4862	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.23.8	Supplying and placing in position HIGH YEILD-STRENGTH DEFORMED STEEL BARS REINFORCEMENT of Grade Fe500D (TMT) conforming to IS:1786, for RCC work including transporting the Steel, straightening, cleaning, decoiling, cutting, bending to required shapes and lengths as per details, binding with 18 SWG black soft annealed binding wire at every intersection, supplying and placing with proper cover blocks, supports, chairs, overlaps, welding, spacers, fanhooks etc. for all heights and depths etc. all complete as directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	100	MT		94290	9429000
4863	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.24	Conc. Encasing - Non FIM Items					
4864	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.24.3	Providing and laying Reinforced Cement Concrete of grade M-25 with 20mm and down size graded stone aggregates for ENCASING OF STRUCTURAL STEEL WORK including chamfering wherever required, vibrating, tamping, curing and rendering if required to give a smooth and even surface etc. (excluding the cost of Reinforcement and Shuttering) for all heights and depths in any shape, position, and thickness etc. all complete as specified and shown. Cement. All materials supplied by the contractor.	1	m^3		9470	9470
4865	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.25	Centering and Shuttering - Non FIM Items					
4866	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.25.1	Providing and fixing CENTERING AND SHUTTERING in foundations, footings,raft beams, slabs, pile caps, retaining walls, jambs, counter-forts, buttresses, trenches, equipment/machine foundations, pedestals, abutments, pipe sleepers, columns, plinth beams, lintels, suspended slabs, beams, staircases, landings, steps, non-circular tunnels/bunkers/ silos/ shafts/ hoppers/liquid storage structures etc. for all depths below and upto & inclusive of plinth level including shuttering for single pour concreting, strutting, bracing, propping etc., keeping the same in position during concreting and removal of the same after specified period etc. for Straight/ Inclined Shuttering, keeping necessary provision for inserts, projecting dowels, anchor bolts or any other fixture etc. all complete and as specified and directed.	2700	m^2		420	1134000
4867	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.25.2	Providing and fixing CENTERING AND SHUTTERING in superstrctures in retaining walls, jambs, counter-forts, buttresses, equipment/ machine foundations, abutments,columns, lintels, suspended slabs, beams, staircases, landings, steps, non-circular tunnels/ bunkers/ silos/ shafts/ hoppers/ liquid storage structures etc. for all heights above plinth level including shuttering for single pour concreting, strutting, bracing, propping etc., keeping the same in position during concreting and removal of the same after specified period etc. for Straight/ Inclined Shuttering, keeping necessary provision for inserts, projecting dowels, anchor bolts or any other fixture etc. all complete and as specified and directed.	50	m^2		760	38000
4868	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26	Expansion joints - Non FIM Items					
4869	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26.1	Providing 20mm wide EXPANSION JOINTS in flooring and pavement slabs and ISOLATION JOINTS around equipment foundations/columns/pedestal/trenches etc. including cleaning the joints of all loose material, filling clean sand for the full depth of slab (upto and inclusive of 300 mm) except for 12mm depth from top and sealing the top 12mm with approved two part liquid polysulphide Sealing Compound as per IS:12118 etc. all complete as shown, specified and directed.	5	m		570	2850
4870	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26.2	Supplying and fixing in position 25mm thick BITUMEN IMPREGNATED FIBRE BOARD conforming to IS:1838 of approved quality in expansion joints at all locations and levels in concrete structures etc. all complete as shown, specified and directed.	5	m^2		1860	9300
4871	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26.3	Supplying and fixing in position 50 mm (2X25 mm) thick BITUMEN IMPREGNATED FIBRE BOARD conforming to IS:1838 of approved quality in expansion joints at all locations and levels in concrete structures etc. all complete as shown, specified and directed.	1	m^2		2210	2210
4872	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26.4	Supplying and sealing EXPANSION JOINTS 25 mm wide and 12mm deep at all locations and levels in Concrete Structures with approved two part liquid POLYSULPHIDE SEALING COMPOUND as per IS:12118 including raking of joints etc. all complete as shown, specified and directed.	25	m		490	12250
4873	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.26.5	Supplying and sealing EXPANSION JOINTS 50 mm wide and 12mm deep at all locations and levels in Concrete Structures with approved two part liquid POLYSULPHIDE SEALING COMPOUND as per IS:12118 including raking of joints etc. all complete as shown, specified and directed.	5	m		630	3150
4874	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.28	Mechanical Rebar Couplers - Non-FIM items					
4875	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.28.3	"Supplying and fixing MECHANICAL REBAR COUPLER of approved make for jointing high strength deformed steel reinforcement bars of Grade Fe500D (conforming to IS:1786) of dia. upto and inclusive of 25 mm at all levels & locations including testing as per manufacturer's recommendations, adjusting etc. all complete as specified and directed. "	5	each		290	1450
4876	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.28.4	"Supplying and fixing MECHANICAL REBAR COUPLER of approved make for jointing high strength deformed steel reinforcement bars of Grade Fe500D (conforming to IS:1786) of dia. above 25 mm at all levels & locations including testing as per manufacturer's recommendations, adjusting etc. all complete as specified and directed. "	5	each		370	1850
4877	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.29	Fixing Re-bars in already cast concrete - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4878	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.29.1	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. upto 12 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	20	each		1060	21200
4879	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.29.2	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. 16 mm & 20 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	10	each		1140	11400
4880	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.2.29.3	Designing, supplying and fixing rebars in already cast concrete, including drilling, cleaning hole with air blow-out & wire-brush and injecting odourless Chemical of approved make, packed in dual foil, with the help of dispenser into a hole of diameter and depth as per manufacture specification, at all levels & locations for high strength deformed steel reinforcement bars of dia. 25 mm & 28 mm of Grade Fe500D (conforming to IS:1786), DESIGNED FOR FULL TENSILE ANCHORAGE, including testing (as per manufacturer's recommendations), adjusting and making good any damage done to the structure etc. all complete as specified and directed. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE EXCLUDING REINFORCEMENT BARS.	5	each		1420	7100
4881	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4	STRUCTURAL STEEL WORKS SPEC NO. 6-68-0006					
4882	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1	General Steel Works - FIM Items					
4883	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1.5	Transporting from storage yard (or any other location as specified by engineer-in-charge), Storing, Assembling and Erecting in position and testing/ examining, bolted and/ or welded, already Fabricated STRUCTURAL STEEL (of any Grade) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. ALREADY FABRICATED STRUCTURAL STEEL SHALL (WITH CONNECTION BOLTS) BE PROVIDED TO CONTRACTOR FREE OF COST. SUPPLY OF ALL OTHER MATERIAL IN CONTRACTOR'S SCOPE.	0.5	MT		17310	8655
4884	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1.6	Transporting from storage yard (or any other location as specified by engineer-in-charge), Storing, Assembling and Erecting in position and testing/ examining, bolted and/ or welded, already Fabricated STRUCTURAL STEEL (of any Grade) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. ALREADY FABRICATED STRUCTURAL STEEL SHALL (WITH CONNECTION BOLTS) BE PROVIDED TO CONTRACTOR FREE OF COST. SUPPLY OF ALL OTHER MATERIAL IN CONTRACTOR'S SCOPE.	0.5	MT		27600	13800
4885	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1.9	Modification and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY FABRICATED BY OTHERS, including all builtup/ compound sections made out of rolled/ hollow sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos,bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding etc., all complete as specified and directed. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY FABRICATED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	0.5	MT		45110	22555
4886	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1.MD1407	Dismantling, modification & re-erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY ERECTED BY OTHERS at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, repair of damaged portion of primer as per Sl No 3.1 of Table 3 of Standard Specification for Surface Preparation and Protective Coating Document No. 6-79-0020 (or as per Job Specification, wherever applicable), grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY ERECTED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	1	MT		54700	54700

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4887	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.1.MD1408	Dismantling, modification & re-erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS ALREADY ERECTED BY OTHERS at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, repair of damaged portion of primer as per Sl No 3.1 of Table 3 of Standard Specification for Surface Preparation and Protective Coating Document No. 6-79-0020 (or as per Job Specification, wherever applicable), grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified etc., all complete. SUPPLY OF ALL OTHER MATERIAL (OTHER THAN ALREADY ERECTED STRUCTURAL STEEL) IN CONTRACTOR'S SCOPE.	1	MT		65000	65000
4888	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3	General Steel Works - Non FIM Items					
4889	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1403	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (confirming to IS:2062) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer(1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		131770	131770
4890	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1404	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (confirming to IS:2062) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		142100	142100
4891	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1405	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (conforming to IS:2062 at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer(1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT) , as per EIL Specification No. 6-79- 0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		132960	132960
4892	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1406	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E250BR / E250B0 (conforming to IS:2062 at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT) , as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		143290	143290

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4893	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1413	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062) at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		134020	134020
4894	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1414	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062) at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL, including all builtup sections/ compound sections made out of rolled sections and/or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	1	MT		144340	144340
4895	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1415	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062 at all locations and levels UPTO & INCLUSIVE OF 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79- 0020 (or as per Job Specification, wherever applicable) after fabrication etc.. all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	165	MT		136930	22593450
4896	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.3.MD1416	Supplying, Fabricating at CONTRACTOR's shop outside the plant boundary, transporting fabricated items to site, unloading, storing, erecting in position and testing/ examining , bolted and/ or welded STRUCTURAL STEEL WORKS of Grade E350BR / E350B0 (conforming to IS:2062 at all locations and levels MORE THAN 20 m ABOVE HPP/ FGL including all builtup sections/ compound sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks, floor beams, stairs, or any other structural items or accessories to support equipments, piping, conveyor galleries, towers, masts, etc., but excluding silos, bunkers, hoppers, etc., cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Nonshrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc.. all complete. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	5	MT		147250	736250
4897	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4	Painting - Non FIM Items					
4898	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4.MD1408	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 5.2 of Table 5 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the coat of shop primer already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of shop primer coat as per Sl. No. 3.1 of Table 3 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable), for steel structures (excluding hand rails) at all location & levels, all complete as specified, for OFFSITE (INLAND) areas. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on structural steel weight).	12500	MT		13740	171750000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4899	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4.MD1411	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 4.1 of Table 4.0 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) for painting(including primer) over the galvanisation already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of galvanisation (as per notes of table 4 of EIL specification no. 6-79- 0020 or as per Job Specification, wherever applicable), for HAND RAILS at all location & levels, all complete as specified. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on weight of steel).	100	MT		14650	1465000
4900	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4.MD1412	Supplying and applying COATING (Post erection/Field) of approved quality and shade as per Sl. no. 5.2 of Table 5 of EIL specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the damaged area requiring repair/rectification, including storage, surface preparation as per ST.2, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc., for all steel structures (excluding handrails) at all location & levels all complete as specified, in OFFSITE (INLAND) areas. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on surface area in Sqm)	20	sqm		550	11000
4901	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4.MD1414	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. no. 4.1 of Table 4 of EIL specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) over the damaged area requiring repair/rectification, including storage, surface preparation as per ST.2, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. for HANDRAIL at all location & levels, all complete as specified. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on surface area in Sqm)	10	sqm		480	4800
4902	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.4.MD1415	Supply and Applying Anti-carbonation paint including primer, intermediate and final coats after surface preparation including storage, degreasing, drying providing temporary staging, scaffolding, inspection and testing etc. on all concrete surfaces in superstructure as specified in Doc no. No. B957-000-06-42-PLS-01.	2000	sqm		720	1440000
4903	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.6	Barricading Structure - Non FIM Item					
4904	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.4.6.1	Supplying, transporting, storing, fabricating & erecting in position and testing/ examining bolted and/ or welded STRUCTURAL STEEL WORKS FOR BARRICADING, of Grade E250A / E250BR / E250B0 (conforming to IS:2062) and/ or CFSHS/ CFRHS of Grade YSt 310 (conforming to IS:4923) and/ or CFCHS of Grade YSt 310 (conforming to IS:1161) at all locations and levels, including all built-up sections/ compound/ hollow/ tubular sections made out of rolled sections and/ or plates/ bent plates in all types of structural frameworks for isolating the construction area, cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints, finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, grouting with Ordinary Grout or premix free flow Non-shrink Grout as specified, including preparation and submission of detailed fabrication drawings, preparing the surface for painting and applying pre-erection/ shop primer as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) after fabrication etc., AND maintaining the structure during project execution AND dismantling, removing & taking away all materials outside the plant boundary after completion of the project, to the complete satisfaction of Engineer-in-charge all complete as per the direction of Engineer-in-Charge. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE.	20	MT		63860	1277200
4905	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.5	STRUCTURAL STEEL WORKS (TUBULAR/HOLLOW SECTION) (REFER SPECIFICATION NO.6-68-0007)					
4906	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.5.9	Yst 355 IS 4923					
4907	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.5.9.MD1403	Supplying, transporting, storing, fabricating, erecting in position & testing/examining at all locations and levels, bolted and/or welded STRUCTURAL STEEL WORKS of all types using "COLD FORMED (RECTANGULAR/SQUARE) HOLLOW SECTIONS conforming to IS: 4923, Grade Yst-355 of approved make" in all type of trusses, purlins, girders, side rails, columns, runners, beams, ties, portals, framework, bracing, brackets, sag rods etc. including all handling straightening/bending if required, cutting to required size & shape, edge preparation, welding & bolting of joints, providing and fixing end caps and plugging holes, fixing in line and level with necessary temporary staging and removal of the same after erection, grouting with Ordinary/ premix free flow Non- Shrink Grout as specified, preparation and submission of detailed fabrication drawings, preparing the exposed surfaces for painting (SSPC-SP-10) and applying pre-erection/ shop primer (1 coat of F-9 @ 65-75 micron DFT and 1 coat of P-6 @ 40 micron DFT), as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) etc. all complete as specified and directed (SUPPLY OF ALL MATERIALS INCLUDING PLATES IN CONTRACTOR'S SCOPE).	130	MT		156940	20402200
4908	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6	MISCELLANEOUS STEEL WORKS SPECIFICATIONS NO. 6-68-0008					
4909	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.1	Anchor Bolts - FIM Items					
4910	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.1.2	Fixing and keeping in position at all levels and locations already fabricated THREADED ANCHOR BOLTS of all diameters and nomenclature supplied by the owner as Free Issue including nuts, washers, anchor plates, pipe sleeves etc. in foundations, columns, pedestals, slabs, beams, walls etc. or any other place as directed including transporting the same from owner's store/issue points to site of work handling , straightening if required, turning from relevant size M.S. rounds to required diameter, threading, welding, providing necessary templates and auxiliary dummy structures, if any, necessary tying and welding with reinforcement, adjustment of shuttering & reinforcement/any other fixture, greasing exposed metal surfaces, covering bolts and packing the sleeves with jute cloth etc. all complete as specified and directed. (BOLTS SHALL BE SUPPLIED BY THE OWNER AS FREE ISSUE) .	0.5	MT		30360	15180
4911	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.15	Anchor Bolts - Non FIM Items					
4912	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.15.1	Supplying, fabricating, fixing and keeping in position at all levels and locations THREADED ANCHOR BOLTS of all diameters and nomenclature including nuts, washers, anchor plates, pipe sleeves etc. in foundations, columns, pedestals, slabs, beams, walls etc. or any other place as directed including handling & transporting, straightening if required, turning from relevant size M.S. rounds to required diameter, threading, welding, providing necessary templates and auxiliary dummy structures, if any, necessary tying and welding with reinforcement, adjustment of shuttering & reinforcement/any other fixture, greasing exposed metal surfaces, covering bolts and packing the sleeves with jute cloth etc. all complete as specified and directed.(SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	5	MT		137670	688350
4913	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.16	MS Metal Inserts - Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4914	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.16.1	Supplying, transporting, storing, fabricating and fixing in position M.S. METAL INSERT (with lugs) of any shape made out of flats, plates, rolled sections, pipes etc. providing necessary templates, staging, cutting, straightening, if required, bolting, welding as required and embedding in position on both Plain and Reinforced Cement concrete members inclusive of adjusting shuttering & reinforcement/ any other fixture, welding where necessary, tying and holding to correct level, line and position, any auxiliary dummy structures to support the heavy inserts, painting exposed surfaces with a coat of primer as per EIL Specification No. 6-79-0020 (or as per Job Specification wherever applicable), etc. all complete for all depths and heights as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	2	MT		144410	288820
4915	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.17	GI Pipe Sleeves - Non FIM Items					
4916	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.17.1	Supplying, fabricating and fixing in position G.I. PIPE SLEEVES of all diameters including providing necessary staging, cutting, straightening if required, bolting, welding as required and embedding in position on both Plain and Reinforced Cement concrete members inclusive of adjusting shuttering & reinforcement/any other fixture, welding where necessary, tying and holding to correct level, line and position, any auxiliary dummy structures to support heavy sleeves etc. all complete for all depths and heights as specified and directed.	0.5	MT		131740	65870
4917	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.18	MS Chequered Plates - Non FIM Items					
4918	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.18.1	Supplying, fabricating and erecting in position at all levels and locations bolted, screwed and/or welded M.S. CHEQUERED PLATES of any thickness in walkways, platforms, stair treads, any other place as directed etc. including cutting to required size, shape, making holes, notches, openings of required size, nosing, straightening if required, making the edges smooth, removing the burrs, fixing, welding, preparation and submission of fabrication drawings and preparing the surfaces for painting and applying shop primer as per EIL Specification No. 6-79-0020 (or Job Specification, wherever applicable) after fabrication etc. all complete as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	0.5	MT		141520	70760
4919	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.19	MS Grating Cat. A,B - Non FIM Items					
4920	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.19.6	Supplying, fabricating and erecting in position at all levels and locations ELECTROFORGED HOT-DIP GALVANISED GRATING (purchased from approved manufacturer by the Contractor) conforming to EIL Standard No. 7-68-0697 (in walkways, platforms, stair treads etc.) including cutting to required size, shape, making holes, notches, openings of required size, nosing, straightening if required, making the edges smooth, removing the burrs, fixing with manufacturer's supplied Hot-dip galvanised clamps, preparation and submission of fabrication drawings, all complete as specified and directed. SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE.	10	MT		138560	1385600
4921	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.19.7	Making openings in galvanized grating for pipes / ducts etc., at all levels and at at all locations by cutting the existing grating and providing 50x6 galvanised flat as toe protection for the openings by welding and application of galvanized paint as per EIL Standard No. 7-68-0697, all complete. Payment shall be made as per number of openings.	50	each		1460	73000
4922	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.22	MS Rungs - Non FIM Items					
4923	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.22.1	Supplying, fabricating, fixing and keeping in position M.S. RUNGS in R.C.C. works at all depths and heights including handling, transporting the steel to site workshop and site of work, straightening, if required, cutting, bending to shape, necessary tying and welding with reinforcement, adjustment of shuttering, cleaning, surface preparation, shop primer as per EIL Spec. 6-79-0020 (or Job Specification, wherever applicable) and two coats of anticorrosive paint of approved quality on the exposed portion of rungs etc. all complete as specified and directed (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	25	kg		100	2500
4924	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.23	Hand Railing 1000mm - Non FIM Items					
4925	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.23.MD1401	Supplying, fabricating and fixing in position at all locations 1000mm high INCLINED HAND RAILING (for staircases) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade M.S. Tubes conforming to IS:1239 including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable) , preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	125	m		1940	242500
4926	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.23.MD1403	Supplying, fabricating and fixing in position at all locations 1000mm high HORIZONTAL HAND RAILING (for platforms, walkways, etc. or any other location as directed) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade MS Tubes conforming to IS:1239 and 100x5 MS Toe Plate confirming to IS:2062 (Grade A/B), including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable), preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	250	m		1830	457500
4927	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.24	Hand Railing 500mm - Non FIM Items					
4928	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.24.MD1401	Supplying, fabricating and fixing in position at all locations 500mm HIGH INCLINED HAND RAILING (for stair cases) consisting of top rail & vertical posts (maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade M.S. Tubes conforming to IS:1239 including straightening if required, cutting, bending, welding, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79 -0020 (or as per Job Specification, wherever applicable), preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	10	m		970	9700

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4929	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.24.MD1402	Supplying, fabricating and fixing in position at all locations 500mm high HORIZONTAL HAND RAILING (for platforms, walkways, etc. or any other location as directed) consisting of top rail, mid rail and vertical posts (Maximum spacing 1500mm c/c) with 32mm nominal diameter medium grade MS Tubes conforming to IS:1239 and 100x5 MS Toe Plate confirming to IS:2062 (Grade A/B), including straightening if required, cutting, bending, welding, bolting, grouting with ordinary grout, cleaning, surface preparation, hot-dip galvanising as per Sl. No. 4.1 of Table 4 of EIL SPEC. 6-79-0020 (or as per Job Specification, wherever applicable) , preparation and submission of fabrication drawings etc. all complete as specified, shown and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE). (Complete handrail work shall be measured as length of top rail only and not length of each element fixed).	20	m		890	17800
4930	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.25	Mechanical Anchor fastners - Non FIM Items					
4931	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.25.1	"Supplying, handling, transporting to site of work and fixing approved MECHANICAL ANCHOR FASTENERS M.S. bolts of Grade 5.8 or more, GALVANIZED with minimum thickness of 5 microns (approved for use in cracked concrete), of 12mm dia at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush, and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	15	each		480	7200
4932	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.25.2	"Supplying, handling, transporting to site of work and fixing approved MECHANICAL ANCHOR FASTENERS M.S. bolts of Grade 5.8 or more, GALVANIZED with minimum thickness of 5 microns (approved for use in cracked concrete), of 16mm dia at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush, and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	10	each		880	8800
4933	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.26	Chemical Anchor Fastner					
4934	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.26.1	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 12mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size, testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	10	each		1840	18400
4935	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.26.2	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 16mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	20	each		2270	45400
4936	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.26.3	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 20mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	70	each		2800	196000
4937	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.26.4	"Supplying, handling, transporting to site of work and fixing approved CHEMICAL ANCHOR FASTENERS consisting of M.S. threaded rod of Grade 5.8, GALVANIZED with minimum thickness of 5 microns and chemical (approved for use in cracked concrete), packed in flexible chemical foil or dual foil type, to be used with the help of dispenser, of 24mm dia. at specified positions on concrete floors, roofs, beams (sides and bottom), walls, columns etc. according to manufacturer's specifications including all accessories like nuts, washers etc. of required size., testing, necessary scaffolding, drilling of the holes in concrete surface with electric drill, cleaning of holes with air blowout & wire-brush and making good any damage done to the structure etc. all complete for all heights, depths and locations as specified and directed. "	25	each		3490	87250
4938	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.27	Threaded bolts for equipment fixing-Non FIM					
4939	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.6.27.1	Supplying, fabricating, fixing and keeping in position at all levels and locations THREADED BOLTS of Grade C property class 4.8 as per IS:1363 (part 2) of all diameters and length including nuts, washers for supporting equipment on steel structure as directed including handling & transporting, straightening if required, turning from relevant size M.S. rounds to required diameter, threading etc. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	0.5	MT		143600	71800
4940	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7	BRICK MASONRY (REFER SPECIFICATION NO.6-68-0009)					
4941	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7.9	CLASS 5.0 at all depths -Non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4942	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7.9.1	Providing and laying BRICK MASONRY WITH BRICKS OF CLASS 5.0 in cement mortar 1:6 (1 Cement : 6 Sand) in one or more brick thickness and in any shape (excluding circular/curved brick masonry) at all depths below plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of bricks, cutting and laying of bricks, providing recesses, making openings of any shape & size, finishing the joints flush below ground level and raking out the joints above ground level, sealing the gap between masonry and soffit of beam/slab, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	2	m³		9960	19920
4943	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7.9.2	Providing and laying BRICK MASONRY WITH BRICKS OF CLASS 5.0 in cement mortar 1:6 (1 Cement : 6 Sand) in one or more brick thickness and in any shape (excluding circular/curved brick masonry) at all heights above plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of bricks, cutting and laying of bricks, providing recesses, making openings of any shape & size, finishing the joints flush below ground level and raking out the joints above ground level, sealing the gap between masonry and soffit of beam/slab, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	1	m³		10650	10650
4944	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7.11	HALF BRICK MASONARY with bricks of CLASS 5.0-Non FIM Items					
4945	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.7.11.1	Providing and laying HALF BRICK MASONRY with bricks of CLASS 5.0 in cement mortar 1:4 (1 Cement : 4 Sand)in any shape, including the cost of materials, labour, scaffolding/staging, sampling and testing, soaking of bricks, cutting and laying of bricks, providing openings of any shape & size, raking out the joints, supplying and placing 2 Nos. 6mm dia. M.S. Bars at every fourth course, sealing the gap between masonry and soffit of beam/slab, embedding the fittings and fixtures, curing etc. all complete as per specification. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY CONTRACTOR.	10	m²		1230	12300
4946	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10	DEMOLISHING AND DISMANTLING (REFER SPEC NO. 6-68-0012)					
4947	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.1	Brickwork - Non FIM Items					
4948	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.1.1	Demolishing BRICKWORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	0.5	m³		1800	900
4949	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.1.2	Demolishing BRICKWORK (taking all necessary safety precautions) for all heights above plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	0.5	m³		1960	980
4950	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2	RCC - Non FIM Items					
4951	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.1	Demolishing RCC WORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, straightening, scraping and cleaning of reinforcement bars, stacking of serviceable materials, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	2	m³		2530	5060
4952	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.2	Demolishing RCC WORK (taking all necessary safety precautions) for all heights above plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, straightening, scraping and cleaning of reinforcement bars, stacking of serviceable materials, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	0.5	m³		2710	1355
4953	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.3	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, upto & inclusive of 25mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m²		580	1160
4954	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.4	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, beyond 25mm and upto & inclusive of 50mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m²		730	1460
4955	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.5	Chipping of RCC WORK (taking all necessary safety precautions) by CHISELLING, beyond 50mm and upto & inclusive of 100mm thickness including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc., cutting, lapping/welding of reinforcement bars as per drawings, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete at all heights and depths, as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m²		1130	2260
4956	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.6	Chipping of RCC WORK (taking all necessary safety precaution) by CHISELLING for thickness more than 100mm for all depths below plinth level including supply of all tools & tackles, scaffolding, propping, underpinning, etc. exposing, cutting, lapping/welding the reinforcement bars as per drawings & cleaning the same by wire brushing, washing the exposed surfaces, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation and backfilling shall be paid separately under relevant items).	2	m³		4530	9060
4957	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.7	Chipping of RCC WORK (taking all necessary safety precaution) by CHISELLING for thickness more than 100mm for all heights above plinth level including supply of all tools & tackles, scaffolding, propping, underpinning, etc. exposing, cutting, lapping/welding the reinforcement bars as per drawings & cleaning the same by wire brushing, washing the exposed surfaces, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed.	2	m³		4990	9980
4958	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.11	Making cut-outs in RCC slab/ wall upto a thickness of 400mm (taking all necessary safety precautions) by vibration-less spark-free mechanical means like core-cutting, wet cutting by diamond wall saw system at all depths & heights including supply of all tools & tackles, necessary scaffolding etc. cutting of reinforcement bars, disposal of unserviceable material, plastering & finishing the cut surfaces, all complete as specified and directed by the Engineer-in- Charge (Measurement on Plan/ Elevation Area basis).	2	m³		15450	30900

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4959	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.12	Cutting/ Dismantling RCC work in pavement, slabs, beams, columns, etc upto a depth of 450 mm by using vibration-less spark-free Diamond Saw Cutter of make HILTI (or equivalent) at all depths & heights, in hazardous areas within process units & offsite which are fire prone due to presence of hydrocarbon vapours etc. taking elaborate precautions for dismantling as per fire permit, clearance etc. and work is to be done with extreme caution. The work item includes cost of all necessary accessories, tools & tackles including diamond saw cutter, disposal of RCC Debris upto lead of 100 m & for all lifts (taking all safety precautions) including cutting reinforcement bars, embedded structural steel members, with necessary scaffolding, propping and underpinning etc. for all elevations with all labour and materials, all complete as per drawings, specifications and directions of the Engineer-in-charge. Payment will be made per sq.m.of cross-sectional cut area. Contractor to submit dismantling plan prior to start of dismantling. Dismantling shall be planned in such a way that each cut piece shall weigh not less than 1.6 MT.	2	m²		10380	20760
4960	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.2.13	Cutting/ Dismantling of RCC block foundations, raft foundations, pile caps, mass concrete, equipment foundations etc. by using vibration-less spark-free Diamond Wire Saw Cutter of make HILTI (or equivalent) at all depths & heights, in hazardous areas within process units & offsite which are fire prone due to presence of hydrocarbon vapours etc. taking elaborate precautions for dismantling as per fire permit, clearance etc. and work is to be done with extreme caution. The work item includes cost of all necessary accessories, tools & tackles including diamond saw cutter , disposal of RCC Debris upto lead of 100 m & for all lifts (taking all safety precautions) including cutting reinforcement bars, embedded structural steel members, with necessary scaffolding, propping and underpinning etc. for all elevations with all labour and materials complete as per drawings, specificationsand directions of the Engineer-in-charge. Payment will be made per sq.m.of cross-sectional cut area. Contractor to submit dismantling plan prior to start of dismantling. Dismantling shall be planned in such a way that each cut piece shall weigh not less than 1.6 MT.	2	m²		11030	22060
4961	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.3	Pockets - Non FIM Items					
4962	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.3.1	Making POCKETS/HOLES of sizes upto & inclusive of 200 x200x500mm in RCC/PCC works (taking all necessary safety precautions) by chiselling/drilling, including supply of all tools & tackles, necessary scaffolding etc. cutting of reinforcement bars, cleaning the pockets of all debris, disposal of the unserviceable material to spoil heaps anywhere within the plant boundary all complete at all heights & depths as specified and directed.	5	each		530	2650
4963	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.4	PCC _ Non FIM Items					
4964	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.4.1	Demolishing PLAIN CEMENT CONCRETE work (taking all necessary safety precautions) for all depths below plinth level including supply of all tools & tackles, necessary scaffolding, propping, underpinning etc. disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation and backfilling shall be paid separately under relevant items)	5	m³		2070	10350
4965	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.5	Stonework - Non FIM Works					
4966	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.5.1	Demolishing STONE MASONRY WORK (taking all necessary safety precautions) for all depths below plinth level including supply of all tools and tackles, necessary scaffolding, propping, underpinning, cleaning and stacking of serviceable material, disposal of unserviceable material to spoil heaps anywhere within the plant boundary, all complete as specified and directed. (Excavation & backfilling shall be paid separately under relevant items).	25	m³		2090	52250
4967	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.6	Steelwork - Non FIM Items					
4968	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.6.1	Dismantling bolted/rivetted/welded STRUCTURAL STEEL WORK of all descriptions (taking all necessary safety precautions), including supply of all tools and tackles, consumables, necessary scaffolding etc., providing temporary bracings as required, cutting (by flame or saw) gusset plates, bolts, nuts, weldings etc., transporting and stacking of the serviceable materials, cleaning the site of work of all unserviceable materials for disposal to spoil heaps anywhere within the plant boundary, all complete at all depths and heights, as specified and directed.	0.5	MT		12630	6315
4969	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.7	AC / GI Sheets - Non FIM Items					
4970	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.10.7.1	Dismantling GI/asbestos/translucent sheets, ridges, gutters etc. (taking all necessary safety precautions) in roofings and wall claddings, including supply of all tools & tackles, necessary scaffolding, consumables, cutting (by flame or saw) of fixing hooks, transporting and stacking the serviceable materials, cleaning the site and disposal of the unserviceable material to spoil heaps anywhere within the plant boundary, all complete for all levels, as specified and directed.	5	m²		150	750
4971	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11	MISCELLANEOUS ITEMS (REFER SPECIFICATION NO. 6-68-0013)					
4972	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.6	Sand Filling - Non FIM Items					
4973	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.6.1	Supplying and filling approved SAND of specified quality under floors, in foundations, plinths, tank foundations etc. for all depths and heights including cost of sand, royalties, transportation to site for all leads and lifts, including loading, unloading, spreading in layers of loose thickness not exceeding 150 mm, watering, ramming, compacting with mechanical compactors and/or other equipment to the specified levels to achieve 85% relative density as per IS:2720 Part XIV, including preparation of subgrade to the required slope, providing testing apparatus and testing the degree of consolidation all complete as per drawings, specifications and direction of Engineer-in-charge. The rates shall be inclusive of the cost of all labour, material, equipments etc. all complete .	10	m³		3440	34400
4974	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.8	Bitumen - Non FIM Items					
4975	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.8.1	Supplying and applying one coat of HOT BITUMEN VG10 grade conforming to IS:73 @1.5 Kg/sq.m. on Concrete/Brick work surfaces etc. all complete as specified and directed.	2	m²		100	200
4976	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.8.2	Extra over item 01CS.11.8.1 for each additional coat of HOT BITUMEN VG10 grade @ 1.2 Kg/sq.m. on Concrete/Brick work surfaces etc. complete.	2	m²		80	160
4977	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.10	BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE					
4978	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.11.10.1	Supplying and mixing of approved brand of BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE (confirming to EIL Specification No. 6-68-0017) in concrete as per manufacturer's specification for protection of reinforcement against corrosion. Supply of admixture in Contractor's scope.	1700	kg		220	374000
4979	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.14	BONDING FRESH CONCRETE TO OLD CONCRETE BY EPOXY RESIN BONDING SYSTEM (REFER SPECIFICATION NO. 6-68-0056)					
4980	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.14.1	Epoxy Resin - non FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4981	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.14.1.1	Providing and applying approved EPOXY RESIN (prepared as per manufacturer's recommendation) for bonding of fresh concrete to old concrete in all types of structure at all depths and heights including cleaning of concrete surface, removing of all loose concrete pieces, making rough by chiselling, taking off the skin of concrete, application of Epoxy Resin System by spraying, necessary working platforms, props, scaffolding and other safety measures, removal of same after completion etc. all complete as specified and directed. (Excavation, backfilling, removal of surplus earth, keeping pit dry by pumping/bailing subsoil water shall be paid separately under relevant items).	100	kg		1350	135000
4982	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17	FIREPROOFING OF STEEL STRUCTURES (REF SPEC NO 6-68-0033)					
4983	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.11	Concrete - Non FIM Items					
4984	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.11.1	Supply and laying of concrete of grade M30 as per Type-I of EIL Standard Specification 6-68-0033 as fire proofing material with 10 mm and down size graded coarse and fine aggregates including admixture around structural steel members (viz. beams, columns, bracings etc.) all complete; cleaning the steel surfaces, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, vibrating, tamping, curing or providing a layer of approved membrane of curing compound, rendering with cement sand mortar (1:3) wherever required to achieve a smooth and even surface, providing L50x50x6 at corners or as specified in the drawing, applying primer on MS nuts, angles and affected surfaces, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights upto & including 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS INCLUDING CEMENT TO BE SUPPLIED BY THE CONTRACTOR).	1500	m²		3290	4935000
4985	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.12	Vermiculite Concrete for Structural Steel - Non-FIM Items					
4986	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.12.1	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-II of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness around structural steel members (viz. beams, columns, bracings etc.) for the required fire protection from reaching temperature 538 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, applying primer on MS nuts and affected surfaces, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights upto & including 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	8500	m²		4750	40375000
4987	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.12.2	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-II of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness around structural steel members (viz. beams, columns, bracings etc.) for the required fire protection from reaching temperature 538 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062 and stiffeners for members exceeding 600 mm depth, supply and welding of MS nuts on angle and box sections and cover blocks for other sections, supplying, placing and fixing in position galvanized expanded metal sheet with mesh size 4.5 mm x 13.5 mm conforming to IS:412 except on angle and box sections, hot dipped galvanized welded wire fabric reinforcement 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566, and tying the reinforcement to the cover blocks with galvanized 16 SWG tying wire, including cutting, straightening, cleaning, bending, applying primer on MS nuts and affected surfaces, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions at all heights more than 10 m above pavement etc. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	50	m²		5020	251000
4988	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.13	Vermiculite Concrete for Equipments - Non-FIM Items					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
4989	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.17.13.1	Supply and laying of vermiculite based lightweight cementitious concrete coating as per Type-III of EIL Standard Specification 6-68-0033 as fire proofing material of required thickness on equipment/ vessel skirts, saddles and supports for the required fire protection from reaching temperature 427 degree C; cleaning the steel surfaces and applying primer compatible to vermiculite material if required as per manufacturer specifications, supplying, placing and fixing in position cover plates conforming to IS:2062, hot dipped galvanized welded wire fabric reinforcement of 2 mm dia 50 mm x 50 mm mesh conforming to IS:1566 and tying the reinforcement with the pre welded nuts by galvanized 16 SWG tying wire, including straightening, cutting, bending of the reinforcement, including supplying and welding of additional MS nuts if directed by the Engineer-in-charge, applying primer wherever required, curing or providing a layer of approved membrane of curing compound, patching of damaged portion wherever required to achieve a smooth and even surface, providing chamfering at corners, supplying and laying of non-bituminous polysulfide or silicon rubber mastic sealant at terminating edges/ metal joints, painting the surfaces with sealer coat of epoxy polyamide as base and finish coats of coating system No.1 of NORSOK Standard M-501, including the cost of all labour, materials, specified tests, shuttering, staging, scaffolding, working platforms, approaches, etc. for all shapes and positions. all complete as per specifications and directions of Engineer-in-Charge. (ALL MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR).	1400	m²		5710	7994000
4990	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.18	Mechanical works					
4991	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.18.5	Supplying, fabricating and erecting in position MS plates as per detailed drawings, conforming to grade A of IS:2062 on top of all RCC pedestals supporting the sliding saddles of equipments, including cutting, straightening where necessary, rounding rounding unfinished edges by grinding, machining the exposed top surface, making necessary bolt holes, providing and laying ready mixed free flow non-shrink grout below the base plate at all levels & locations, machining top surfaces etc. all complete and as shown and directed.	0.5	MT		141520	70760
4992	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.18.9	Dismantling Of steel works					
4993	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.18.9.1	Dismantling structural steel already erected by others including provision of adequate temporary supports, bracings etc. wherever required, to ensure safety of the affected structure or part thereof, and replacing back all original members into their respective positions true to line and level, removing all temporary supports/bracings, welding/bolting of the end connections, splicing or strengthening the member and their joints to regain original strengths, all complete as directed by the Engineer-in-Charge. Note: The weight of dismantled and re- erected structure shall be measured only once.(SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE)	1	MT		12630	12630
4994	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.23	SAFETY (REFER EIL SPECIFICATION)					
4995	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.23.1	Safety Structures - Non FIM Items					
4996	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.23.1.1	Supplying, Transporting, Storing, Fabricating & Erecting in position and testing/ examining bolted and/ or welded Structural Steel Works at all locations and levels in HANGER SCAFFOLDING below piperack, comprising of hangar channels, fabricated pen wen ladder beams, steel planks bent to shape and size and any other sections, if required, all as per sketches/ specifications and load tested for statisfactory performance, including cutting to required size, straightening/ bending if required, edge preparation, cleaning, preheating, bolting/ welding of joints (including sealing the joints of box sections with continuous welding and plugging any open ends & holes of box sections), finishing edges by grinding, fixing in line and level with temporary staging & bracing and removal of the same after erection, including preparation and submission of detailed fabrication drawings, preparing the surface for painting as per BIS codes after fabrication etc. all complete as specified and directed. All items shall be removed & carried back by Contractor as per instructions of Engineer-in-Charge after completion of works. (Supply of All Material In Contractor's Scope).	50	m²		2430	121500
4997	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.23.1.3	Providing and fixing double scaffolding system of any height made with 40 mm dia MS tube 1.5 m centre to centre, horizontal & vertical tubes joining with MS tubes, MS tube challies, MS clamps and MS staircase system in the scaffolding for working platform/ staircase etc., and maintaining it in a serviceable condition for the required duration as approved and removing it thereafter. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc., wherever required for inspection of work at required locations with essential safety features for the workmen etc., all complete as per directions and approval of Engineer-in-charge. (Height shall be measured from Floor/ platform from where scaffolding is erected) including providing Aluminium ladders for safe acess of workers.	1000	m³		110	110000
4998	B	B957-999-81-41-PK-SOR-9501-B-3M	01CS.23.1.4	Providing of steel scaffold stair tower system with minimum 800 mm wide flights, landings at every 1.5 to 2.0 m height, handrailing around flights and landings for safe access upto a height of 12.0 m, all complete including supply of all materials, tools & tackles, manpower etc., at the location directed by Engineer-in-Charge on monthly rental basis. Rental charges shall be payable after completion of erection of the system and acceptance by the Engineer-in-Charge. Rates shall also be inclusive of dismantling of the system and taking out all materials from the project permises as directed by the Engineer-in-Charge. Rate quoted shall be for Running Meter (Height) per month.	100	RM		5670	567000
4999	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC	GENERAL CIVIL					
5000	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.2	Compound wall/ Chain Link Fencing/ Barbed wire fencing works					
5001	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.2.5	Supplying, fabricating and fixing G.I. chain link fencing with 3.15mm dia. wire, 50x50mm diamond mesh chain link fence fabric conforming to IS:2721 fixed to steel/RCC posts/struts above ground level or above short height compound wall (height upto 1.5m), including supply of chain link fencing fabric in 1.9 metre wide rolls, stretcher bars, staples, etc. required for fixing the fencing, fixing of chain link fencing between straining posts, fixing of bottom of fencing to a concrete sill beams by means of hairpin staples, including supply and fixing line wires, complete as per drawings, specifications and directions of Engineer-in-Charge (All materials shall be supplied by Contractor). (The measurement of chain link fencing shall be on linear basis for 1.9 m wide fencing fabric)	500	m		1430	715000
5002	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7	CONCRETE PAVEMENTS					
5003	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.2	Providing and laying Reinforced Cement Concrete with 20mm and down size graded crushed stone aggregates in flooring, pavements etc. including leaving pockets, if necessary, making recess/drains, laying in alternate panels, etc. for all depths including shuttering, tamping, curing, etc. as specified in any shape, thickness, position and finishing the top surface smooth etc. all complete as per drawings, specifications and directions of Engineer-in-Charge.					

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
5004	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.2.2	For RCC of M-30 grade concrete (all materials including cement but excluding cost of providing & fixing reinforcement and joint sealing shall be supplied by the contractor).	800	m³		9870	7896000
5005	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.6	Supplying and laying of 150 micron thick HM HDPE (Grade-I) FILM lining conforming to IS 10889 below concrete pavements, Hard stand, at any other place etc. including royalties, taxes, handling, transportation, unloading, storage, joining etc. all complete as per drawings, manufacturer's specifications and directions of Engineer-in-charge.	5000	m²		140	700000
5006	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.7	Supply of all materials and Construction of DRY LEAN CEMENT CONCRETE SUB-BASE (7 days compressive strength of 10.0 MPa) with 26.5mm and down size aggregate including cement , water, and approved additives on a prepared sub-grade, mixed in batching plant, transported to site, for all leads & lifts, laid, compacted, finished and cured etc. complete as per IRC:SP:49 (Guidelines for the use of Dry Lean Concrete as Sub-Base), drawings, standards, specifications and directions of Engineer-in-charge.	500	m³		4130	2065000
5007	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.10	Providing 20mm wide Expansion Joints in pavement slabs as per standard/ drawing including cleaning the joints of all loose material, filling with 20mm thick impregnated fibre boards for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. all complete as per drawings, specifications and directions of Engineer-in-Charge.					
5008	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.10.1	For type-I pavement (Upto and inclusive of thickness of 200 mm). (Including providing and laying MS dowel bar, painting as required, GI pipe and cap and cotton waste).	200	m		1870	374000
5009	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.10.3	For type-II pavement (Upto and inclusive of thickness of 150 mm)	250	m		290	72500
5010	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.10.4	For type-III pavement (Upto and inclusive of thickness of 100 mm).	100	m		230	23000
5011	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.11	Providing joints in pavements and around foundations as per standard/ drawing including cleaning the joints of all loose materials and sealing with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge for.					
5012	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.11.1	Construction joints 20mm wide x 25mm deep.	250	m		370	92500
5013	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.11.2	Sealing joint around pedestal and column etc. 20mm wide x 200 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge.	550	m		580	319000
5014	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.11.3	Sealing joint around pedestal and column etc. 20mm wide x 150 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge.	550	m		520	286000
5015	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.7.11.4	Sealing joint around pedestal and column etc. 20mm wide x 100 mm deep including filling with 20mm thick impregnated fire board for the full depth of slab except for 25mm depth from top and sealing the top 25mm with Polysulphide base joint sealant of approved make conforming to BS:5212, including applying 2 coats of approved primer compatible with the brand of Polysulphide etc. complete as per drawings, specifications and directions of Engineer-in-Charge for.	250	m		460	115000
5016	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15	MISC. CIVIL AND STRUCTURAL WORKS FOR U/G PIPING AND OTHER CIVIL WORKS					
5017	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15.1	Providing and laying brick masonry with locally available bricks of specified class (Brick of class lower than specified shall not be accepted) in cement mortar 1:4 (1 cement : 4 Coarse sand) in one or more brick thickness and in any shape in foundation and plinth for valve pits, drains, circular/square maholes, wing walls, etc. including providing recesses, openings, etc. including curing, finishing the joints flush below ground level and raking out joints in plinth with all labour and material, etc. complete as per drawings, specifications and direction of Engineer-in-Charge. For following Brick Class.					
5018	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15.1.1	Cement supplied free of cost by the Owner and following Brick Class					
5019	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15.1.1.1V1	Brick Class 5	175	m³		10250	1793750
5020	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15.2	Providing 13mm thick average cement plaster in cement mortar 1:3 (1 cement: 3 sand) on brick walls/stone masonry/pitching or on concrete surfaces for manholes, valves pits, culverts, wing walls, etc. including cleaning and preparation of the surface, scaffolding, curing etc. for all depths and heights complete as per drawings specifications and direction of Engineer-in-Charge.					
5021	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.15.2.2	All materials including cement supplied by the Contractor.	200	m²		400	80000
5022	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26	MISCELLANEOUS ITEMS					
5023	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.10	Supply and installation of combined safety shower and eyewash units as per spec. no.6-66-0038, including providing and fixing of necessary foundation bolts in foundations/ pavement etc. complete. Each safety shower shall have proper sign board with florescent letters showing their location, all complete as per specification, drawings and direction of Engineer-in-charge.	5	each		47690	238450
5024	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11	Lining/Pitching					
5025	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11.1	Providing and laying 100 mm thick cement concrete lining of M-20 grade with 20mm and down size graded stone aggregates for embankments, road side slopes holding ponds bunds, drains, tank pad, channels or at any other place as directed, including laying cement concrete in alternate panels, shuttering the edges, curing, finishing the top surface rough or smooth complete as per drawings, specifications and directions of Engineer-in-Charge.					
5026	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11.1.3	On horizontal surfaces (All materials including cement supplied by contractor)	100	m²		890	89000
5027	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11.1.4	On sloped surfaces (All materials including cement supplied by contractor)	100	m²		980	98000
5028	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11.2	Providing 20mm wide x 25mm deep contraction joint in lining etc. including cleaning the joints of all loose materials and filling with approved mastic filler conforming to IS:13413, Cleaning joints, applying primer as per IS:5256, clearing the adjoining surface after sealing etc. complete as per drawings, specifications and the directions of Engineer-in-Charge.					
5029	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.11.2.1	For lining depth of 100mm	100	m		250	25000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
5030	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30	Complete work for laying of Double walled corrugated (DWC) HDPE pipes as per IS 16098 Part 2 under roads/ drain crossings for maximum depth of 2m measured from top of DWC pipe upto road top level in all types of soil excluding soft rock and hard rock using HDD (Horizontal Directional Drilling) method using machine including supply of all materials, machinery, manpower etc. complete including cutting and jointing of the pipe as per manufacture's specification required for completion of the job as per directions of Engineer-in-Charge for the following internal diameter (DN) of the pipe - (Length of HDD will be straight length measured between entry and exit point)					
5031	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.1	Dia 160 mm	100	m		16690	1669000
5032	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.2	Dia 200 mm	100	m		22250	2225000
5033	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.3	Dia 400 mm	100	m		44500	4450000
5034	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.4	Dia 500 mm	100	m		55620	5562000
5035	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.5	Dia 600 mm	50	m		66740	3337000
5036	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.26.30.6	Dia 800 mm	50	m		88990	4449500
5037	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.36	Portable/ trolley mounted Extinguishers					
5038	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.36.1	Supply and installation of portable DCP (Dry Chemical Powder Type) extinguisher including transporting to worksite, fixing in position including all accessories and all labor and material etc. complete as per drawings, specification and directions of Engineer-in-Charge.					
5039	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.36.1.1V1	Capacity in Kg 9	20	nos		3560	71200
5040	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40	Fabrication and Erection of piping (underground)					
5041	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20	Laying and joining of externally 3L PE pre-coated Carbon Steel pipes and specials underground including transportation of all material from Owner's storage point to worksite, earthwork in excavation in all types of soils excluding soft rock and hard rock, for pipe trenches, saddles, etc. including dewatering, shoring and strutting if required, dressing of sides, levelling, grading and ramming of bottoms, cutting of pipes to required lengths if required, edge preparation, laying the pipes in trenches to required alignment and levels, welding the same after laying, installation of flanges, blind flanges, tapping for pressure gauges, temperature gauges and all other online instruments, fixing of nuts, bolts, gaskets and washers, welding, carrying out repairs of coating defects not attributed to owner (i.e. defects occurring after taking over of pipes from owner), coating of all field weld joints etc. as per specification, including supply of coating material for field joints,inspection and testing for the corrosion protection coating as per specification, cutting of road wherever required and making good the same,hydrostatic testing of the system, flushing, backfilling the trenches with select material from available excavated soil including re-excavating the deposited soil excavated earlier, breaking clods and laying in layers of 15 cm compacted thickness, watering, compacting with mechanical means like vibro rammers etc. to 90% of dry density as per IS:2720 Part- VII or 85% relative density as per IS: 2720 Part XIV as applicable, making good the surface, disposal of surplus earth/ unserviceable material to demarcated area anywhere within the complex limit etc. complete as per drawings, specifications and instructions of Engineer-in-Charge including connecting the pipes to manhole, including return of all unused / scrap pipes and specials to owner's storage point (All the materials except Pre-coated Pipes and fittings shall be supplied by contractor)(Pre-coated Pipes and fittings shall be issued free of cost by Owner.) (Depth of excavation for pipe trench shall be upto 3.0m)					
5042	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1	Carbon Steel Piping (Non IBR), Thickness <=10 mm					
5043	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1	Fabrication, For the following nominal sizes					
5044	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1.2	NB 2 inch - 6 inch	100	Inch Dia		770	77000
5045	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1.3	NB 8 inch - 14 inch	100	Inch Dia		770	77000
5046	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1.4	NB 16 inch - 24 inch	100	Inch Dia		770	77000
5047	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1.5	NB 26 inch - 36 inch	100	Inch Dia		770	77000
5048	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.1.6	NB 38 inch - 48 inch	100	Inch Dia		770	77000
5049	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2	Erection including corrosion protection coating of field joints, for Water System (Pressure Piping), For following Nominal Sizes					
5050	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2.2	NB 2 inch - 6 inch	400	Inch Mtr		330	132000
5051	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2.3	NB 8 inch - 14 inch	400	Inch Mtr		330	132000
5052	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2.4	NB 16 inch - 24 inch	400	Inch Mtr		330	132000
5053	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2.5	NB 26 inch - 36 inch	800	Inch Mtr		330	264000
5054	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.40.20.1.2.6	NB 38 inch - 48 inch	1000	Inch Mtr		330	330000
5055	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43	Supply, fabrication and Erection of piping (Above ground)					
5056	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1	Fire water spray/ sprinkler/ detection system G.I. PIPING A/G (Screwed)					
5057	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes for Fire water spray system/ sprinkler system/ detection system as per piping material specification including supply of reducing tees, fittings, elbows, nipples, Teflon tapes, white lead etc., cutting the pipes to required lengths, making threads, including laying of pipes on pipe rack, sleepers, T-supports, erection of piping on equipments, pumps etc. including joining of pipes and fittings with threaded/flanged connections, including installation of spray nozzles, Quartzoid bulb detectors, restriction orifice, flanges, break-up flanges, gaskets and bolts, hydrostatic testing of the piping including supply of necessary fittings etc. complete as per specifications, drawings and instructions of Engineer-in-charge.(Spray nozzles, restriction orifice, flanges and break-up flanges shall be paid separately under separate SOR/ shall be given as free issue to the contractor.) For following nominal sizes and piping material class.					
5058	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1.1V9	Dia. 1 Inch PMS J2A	1745	m		800	1396000
5059	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1.1V52	Dia. 1 Inch PMS J95A	165	m		800	132000
5060	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1.1V53	Dia. 2 Inch PMS J95A	1420	m		1770	2513400

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
5061	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1.1V54	Dia. 3 Inch PMS J95A	65	m		2670	173550
5062	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.1.1.1V55	Dia. 4 Inch PMS J95A	165	m		3720	613800
5063	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.3	Fire water spray/ sprinkler/ detection system G.I. PIPING A/G (Welded)					
5064	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.3.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes for Fire water spray system/ sprinkler system/ detection system as per piping material specification including supply of reducing tees, fittings, elbows, nipples, Teflon tapes, white lead etc., cutting the pipes to required lengths, welding, applying zinc silicate coating on welded joints, including laying of pipes on pipe rack, sleepers, T-supports, erection of piping on equipments, pumps etc. including joining of pipes and fittings with welded/flanged connections, including installation of spray nozzles, Quartzoid bulb detectors, restriction orifice, flanges, break-up flanges, gaskets and bolts, hydrostatic testing of the piping including supply of necessary fittings etc. complete as per specifications, drawings and instructions of Engineer-in-charge.(Spray nozzles, restriction orifice, flanges and break-up flanges shall be paid separately under separate SOR/ shall be given as free issue to the contractor.). For following nominal sizes and piping material class.					
5065	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.3.1.1V22	Nominal Dia. 6 Inch Piping Material Class J95A	165	m		6240	1029600
5066	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.43.3.1.1V23	Nominal Dia. 8 Inch Piping Material Class J95A	100	m		9120	912000
5067	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45	Supply and installation of valve assembly, flange assembly etc.					
5068	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2	Supplying the flange assembly conforming to piping material specifications and delivering the same to owner's stores/ work spot etc. Flange assembly shall consist of 2 no. flanges along with one no. matching gasket and one set of matching nuts &, bolts. All complete as per specifications and directions of Engineer-in-Charge. For following nominal size and piping material class					
5069	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V44	Dia. 1 Inch PMS J2A	5	each		1030	5150
5070	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V98	Dia. 2 Inch PMS J95A	5	each		2060	10300
5071	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V99	Dia. 3 Inch PMS J95A	5	each		3090	15450
5072	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V100	Dia. 4 Inch PMS J95A	5	each		4120	20600
5073	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V101	Dia. 6 Inch PMS J95A	20	each		6180	123600
5074	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V102	Dia. 8 Inch PMS J95A	20	each		8240	164800
5075	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.45.2.1V103	Dia. 1 Inch PMS J95A	5	each		1030	5150
5076	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51	fire fighting equipment's					
5077	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2	Supply and installation of Deluge Valve skid					
5078	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2.1	Supply, Installation, erection, testing and commissioning of Deluge valve skid, with UL/FM listed/approved Deluge Valve (consisting of deluge valve, strainers, solenoid valve, air pressure regulator, limit switches, pressure gauge, pressure transmitters, inlet/ outlet valves, drain valve, priming valve, vent valve including alarm motor gong, fittings, local control panel including bypass connection to deluge valve along with strainer and ball valve etc. complete) actuated through air (pneumatic) detection system including installation/placing the skid at the designated location and fixing with anchor bolts, connecting the water inlet and system piping, connecting detection network piping, fittings etc. complete for deluge valve skid as per specification, drawings and directions of Engineer-in-Charge. For the following DV skid size (Inlet/ outlet/ bypass fire water line size - Deluge Valve size -)					
5079	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2.1.1V3	Inlet/ outlet/ bypass fire water line size 4 Inch Deluge Valve size 4 Inch	1	each		731300	731300
5080	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2.1.1V8	Inlet/ outlet/ bypass fire water line size 6 Inch Deluge Valve size 6 Inch	2	each		905370	1810740
5081	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2.1.1V9	Inlet/ outlet/ bypass fire water line size 3 Inch Deluge Valve size 3 Inch	1	each		548990	548990
5082	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.2.1.1V11	Inlet/ outlet/ bypass fire water line size 8 Inch Deluge Valve size 8 Inch	1	each		1207160	1207160
5083	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.3	S/I Portable/ trolley mounted Extinguishers					
5084	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.3.2	Supply and installing in position, trolley mounted DCP (Dry Chemical Powder Type) extinguisher including transporting to worksite, placing in position including all accessories and all labor and material etc. complete as per drawings, specification and directions of Engineer-in-Charge.					
5085	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.3.2.1V2	Capacity 50 kg	5	nos		31210	156050
5086	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.3.5	Supply and installation of portable CO2 extinguishers including transporting to worksite, fixing in position including all accessories and all labor and material etc. complete as per drawings, specification, data sheet and directions of Engineer-in-Charge.					
5087	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.3.5.1V1	Capacity 4.5 kg	20	nos		5090	101800
5088	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5	Supply, installation, testing and commissioning of following firefighting equipment as per relevant specifications, data sheet, drawing, including transporting the equipment to worksite, fixing of nuts, bolts, washers, gaskets, welding needed for fixing the equipment with matching flange etc. all complete as per drawings, specifications, standards, data sheet and direction of Engineer-in-Charge.					
5089	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.9	Hose box cabinet Type-II (self-supporting type) including all inside accessories, including all civil works, fixing in position with anchor bolts in foundations or wall	100	each		22650	2265000
5090	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.12	Remote operated long range water/ water cum foam monitor of 1000/1500/2000 GPM (variable) capacity on technological structure/ pipe rack/independent tower etc.	2	each		4140600	8281200
5091	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.13	Variable flow Water cum foam monitor of 500/750/1000 GPM capacity	20	each		268830	5376600
5092	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.14	Variable flow Water cum foam monitor of 1000/1500/2000 GPM capacity	20	each		396550	7931000
5093	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.15	Stand Post Type Fire Hydrant with Pumper Connection	30	each		30800	924000
5094	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.5.16	Stand Post Type Fire Hydrant without Pumper Connection	90	each		23280	2095200
5095	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.6	Supply of medium velocity spray nozzles with 1/2" NPT fixing arrangement to Owner's storage point, testing etc. all complete as per specification, drawings, data sheet and directions of Engineer-in-Charge. For nozzle of following K factor					
5096	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.6.1V3	K factor 51	38	nos		620	23560

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
5097	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.6.1V9	K factor 22	240	nos		620	148800
5098	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.6.1V10	K factor 35	202	nos		620	125240
5099	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.9	Quartzoid bulb detectors					
5100	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.51.9.2	Supply of quartzoid bulb detectors to be installed in hydraulic line with 1/2" NPT fixing arrangement including MS half coupling to Owners storage point etc. all complete as per specification, drawings, data sheet and directions of Engineer-in-Charge.at locations as per data sheets, drawings and directions of Engineer-in-Charge.	480	nos		450	216000
5101	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.99	Miscellaneous Items					
5102	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.99.01	Miscellaneous					
5103	B	B957-999-81-45-PK-SOR-9501-B-0M	01GC.99.01.MC01	Design, engineering, manufacture, procurement of equipment, materials and bought out components including all civil, structural, electrical, mechanical, instrumentation & piping material, assembly at shop, inspection, testing at manufacturer's works, packing, transportation, delivery including supply of all mandatory spares, commissioning spares, special tools & tackles, first fill of consumables, erection material, foam tank, supporting structure, underground tank, pump etc. including unloading at site, handling, transportation to store and from store to work site, storage at site, construction, assembly at site, erection, installation, testing, pre-commissioning, painting, insulation, commissioning, performance guarantee run, handing over to client and other field works including civil, Structural, electrical, mechanical, instrumentation & piping works etc. all complete as per the enclosed scope of work & standard specifications, instructions to vendors, job specification, data sheets etc. and other codes and standards attached or referred as per the direction of Engineer-in-charge for unloading, storage and loading facility of Foam near existing Foam Tank in BDT terminal including integration with the existing Foam Tank as per P&ID. For detailed specification and work, refer specification no. B957-000-81-45-JS-9502.	1	Lumpsum		2575000	2575000
5104	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG	GEOTECH					
5105	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300	GROUND IMPROVEMENT					
5106	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1	SAND GRAVEL MIX					
5107	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1.1	Supplying and filling sand gravel mix (1:1) with approved aggregate below road, RCC pavement, manholes, pits, foundations, bedding of UG piping etc. in layers of 150 mm loose thickness (maximum) including watering, ramming, rolling, compacting to achieve 85% relative density as per IS 2720 Part-XIV, quarrying, royalties, transportation, handling, etc. all complete as per drawings, specifications and directions of Engineer-in-Charge. (The rate shall be inclusive of the cost of all labour, material, equipment etc. all complete)	250	cum		2770	692500
5108	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1.MB1	ROCK ANCHORS					
5109	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1.MB1.1	Installation of Rock Anchor including Supply, fabrication of HYSD steel bar reinforcement of 25mm of grade Fe500D conforming to IS:1786, transporting the steel, straightening, cleaning, cutting, overlapping, welding, bending to required Shapes and length etc., drilling hole of 100mm nominal dia. upto a maximum length of 2m, mobilization of drilling equipment, compressor and other necessary plant and equipment, placing reinforcement with spacer/ centralizers upto specified depth, grouting of holes with cement grout Minimum Strength of 40 N/mm2, all complete as per drawing, specification and instruction of Engineer in charge. All material are in contractor's scope of supply.	100	m		4480	448000
5110	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1.MB1.2	Conducting Verification Pullout load test on Rock Anchor up to 2 times the design load (13.5 Ton) including supply & erection of testing equipment, supervision, labour etc. all complete as per specifications and directions of Engineer-in-Charge, analysing the results, making the report and submitting the same in 5 copies.	3	each		99570	298710
5111	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.1.MB1.3	Conducting Proof load test on Rock Anchor up to 1.5 times the design load (13.5 Ton) including supply & erection of testing equipment, supervision, labour etc. all complete as per specifications and directions of Engineer-in-Charge, analyzing the results, making the report and submitting the same in 5 copies.	4	each		99570	398280
5112	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.2	GEOGRID					
5113	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.2.1	Supplying and laying of Tensar Geogrid SS-40 or equivalent below roads, RCC pavements, manholes, in pipe trenches, culverts, foundations, hard stand etc. including overlap length, royalties, taxes, handling, transportation, unloading, storage, etc. all complete as per drawings, manufacturers specification and direction of Engineer-in-Charge.	200	sqm		430	86000
5114	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.4	Boulder Soling					
5115	B	B957-999-81-47-PK-SOR-9501-B-0M	01GG.300.4.1	Supplying and laying of random rubble soling below hardstand, road, RCC pavement, foundation etc. in layers of 200 mm loose thickness (maximum) with nominal size of stones 100 mm to 250 mm, filling of voids with small size stones and sand, including watering, ramming, rolling, compacting, quarrying, royalties, transportation, handling etc. all complete as per specifications, drawing and directions of the Engineer-in-charge. (The rate shall be inclusive of cost of all labour, material,equipment etc., all complete).	50	cum		2840	142000
5116	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP	PROJECTS					
5117	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999	Providing pre-commissioning/commissioning assistance to the Owner/EIL by providing Skilled /Semiskilled/unskilled workers as per the direction of Engineer in - Charge with tools tackles, PPEs, consumables and Supervision (including site supervision, safety supervision) with the single point responsibility for quality, safety and speed of execution (one Man day =8 hours shift) with 1 vehicle standby for emergency at site with the following manpower on fix basis. Contractor to provide & mobilise man power in shifts on Need Basis on the instructions of Engineer -in-chrge. Note that the manpower deployment shall be inclusive of required tools and tackles and machinery such as welding machines, grinding machines, gas cutting sets , Mechanical/Electrical tool box, etc.					
5118	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000	Skilled manpower					
5119	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.100	Piping Welder (Arc & TIG)	260	Mandays		1480	384800
5120	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.200	Mill Wright fitter/ Rotary mechanic	300	Mandays		1480	444000
5121	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.300	Instrument Technician	200	Mandays		1480	296000

Sl. No.	PART NO	SOR NO	ITEM NO	DESCRIPTION	QTY	UOM	CURRENCY	RATE	AMOUNT
5122	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.400	Electrician	100	Mandays		1480	148000
5123	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.500	Valve Mechanic	180	Mandays		1480	266400
5124	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.10000.600	Rotary mechanic capable of executing maintenance work	260	Mandays		1480	384800
5125	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.11000	DEWATERING : Pumping out rain water from specific location towards downstream side by deploying suitable capacity / adequate numbers of mud pumps / submersible pumps from various types drains / culverts sump pits / unit areas discharge into the outlet point laying and connecting of discharge delivery pipe mentioned in the same contract as directed by Engineer-In-charge at site including supply of all pumps, power/diesel , connecting pipes / hoses, all enabling works, tools and tackles etc. completely in all respect as per the directions of the Engineer-In-charge. (Jointly accepted log book to be maintained for payment)					
5126	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.11000.100	10 HP PUMP (POWER/DIESEL operated)	10	Hour		1320	13200
5127	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.11000.200	5 HP PUMP (POWER/DIESEL operated)	10	Hour		1010	10100
5128	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.11000.300	2 HP PUMP (POWER/DIESEL operated)	10	Hour		610	6100
5129	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.12000	Contractor to provide & mobilise following man power on the instructions of Engineer in- charge. However, 2 weeks' notice shall be given for mobilisation and 1 day notice Shall be given for demobilisation. Note that quoted rate of manpower deployment shall be inclusive of required PPEs and facilities required for functioning at site. (1 Man-Month should be considered as 30 man-days.					
5130	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.12000.100	Safety supervisor	18	Man month		78120	1406160
5131	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.12000.200	Safety Officer/Engineer	18	Man month		97650	1757700
5132	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000	Semi-skilled Manpower					
5133	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.100	Piping/structural fitter	800	Mandays		1140	912000
5134	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.200	Structural welder	700	Mandays		1140	798000
5135	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.300	Gas cutter	800	Mandays		1140	912000
5136	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.400	Grinder/driller	800	Mandays		1140	912000
5137	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.500	Rigger	800	Mandays		1140	912000
5138	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.20000.600	Concrete chipper	300	Mandays		1140	342000
5139	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.30000	Unskilled manpower					
5140	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.30000.100	Helper/Assistants	3900	Mandays		850	3315000
5141	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.40000	Commissioning operator (Qualification degree with 3 yrs. of experience or diploma with 5 years' experience) --	600	Mandays		3200	1920000
5142	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.50000	Commissioning supervisor (B.E. with 5 years' experience of commissioning activities in refineries, petrochemical etc) (1 man month= 26 days @ 8 hours per day duty)	16	Man month		90000	1440000
5143	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.60000	Supervisor/ Foreman	16	Mandays		1900	30400
5144	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.70000	Fork lift operator (1 man month= 26 days @ 8 hours per day duty)	3	Man month		43680	131040
5145	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.70001	Supply of Flame proof torches- rechargeable (with high intensity)	10	nos		8500	85000
5146	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.70002	Supply of 40/80 wire-mesh SS for covering strainers/filters	50	nos		2580	129000
5147	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.70003	Supply of rubber hoses(1", 15 mtr length, pressure-500 psi)	20	nos		7730	154600
5148	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.70004	Supply of fire hoses with connector for fire hydrants (dia. 63 mm, length-15 mtr as per relevant international specifications)	20	nos		7210	144200
5149	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.80000	Providing Hydraulic mobile Crane (min. 15 Ton capacity wheel mounted) including fuel, lube and operator & helper charges, sling web belts d-shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipe-spools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		8850	265500
5150	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.90000	Providing trailer including fuel, lube and operator & khalasi charges for transportation of material (including pipes, structural steel, fittings, valves, gaskets, earth, wooden scrap, usable material, metallic or non-metallic scrap) from & to project/unit area, stores, warehouse, dump yard/scrap yard as directed. (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASED FOR COMMISSIONING	30	day		7500	225000
5151	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.98000	Providing "Telescopic/Lattice" type crane (100 Ton capacity wheel mounted/CRAWLER) including fuel, lube and operator & helper charges, sling web belts d- shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipe-spools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day= 8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		50000	1500000
5152	B	B957-999-85-41-PK-SOR-9501-B-2M	01QP.999.99000	Providing "Telescopic" type crane (40 Ton capacity wheel mounted) including fuel, lube and operator & helper charges, sling web belts d- shackles, guiding ropes etc for lifting/shifting/loading/ unloading material like pipes, equipment, fittings, pipespools, concrete blocks, drums, boxes boulders, crates, scraps etc as directed (1 day=8 hours; time of deployment shall be reckoned from time of machinery reporting to site time of releasing from site. Part duration shall be paid on pro-rata basis) NEED BASE	30	day		25000	750000
		SUB TOTAL							**2852433266.00**
		TOTAL							**7097662785.00**

BIDDING DOCUMENT

FOR

COMPOSITE WORKS FOR UTILITIES & OFF-SITES (PART-A & PART-B)

(BIDDING DOCUMENT NO.: JP/B957-999-PK-T-9501/1031)

PROJECT: BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PART - III OF III : TECHNICAL PART

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)

ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

COMPOSITE WORKS TENDER

FOR

Utilities & Offsite (PART-A & B)

(Document No: B957-999-69-41-PK-T-9501)

PROJECT : OVERALL PROJECT MANAGEMNET AS MPMC & PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT & U&O FOR BPREP

OWNER : BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PMC / EPCM : ENGINEERS INDIA LIMITED (EIL)

JOB NO. : B957

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	18.03.2026	ISSUE FOR TENDER	MKY	KB	SV

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SCOPE OF WORK & SUPPLY

(PIPING)

(TENDER NO.: B957-999-69-41-PK-T-9501)

PROJECT : **EPCM SERVICES FOR BINA PETCHEM & REFINERY EXPANSION PROJECT, BPREP**

OWNER : **M/s BHARAT PETROLEUM CORPORATION LIMITED**

UNIT : **OFFSITE**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Chkd by	Approved by
A	17/03//2026	ISSUED FOR TENDER	UC/CC	DG	RKG

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ABBREVIATIONS:

GAD	: General Arrangement Drawing
G.I.	: Galvanized Iron
IBR	: Indian Boiler Regulations
ISBL	: Inside Battery Limit
L.P. Steam	: Low Pressure Steam
LSTK	: Lump Sum Turn Key
M.P. Steam	: Medium Pressure Steam
NDT	: Non-Destructive Testing
OSBL	: Outside Battery Limit
PAUT	: Phased Array Ultrasonic Testing
PMI	: Positive Material Identification
PMS	: Piping Material Specification
P&ID	: Piping and Instrumentation Diagram
PSV	: Pressure Safety Valve
RFID	: Radio Frequency Identification
SOR	: Schedule of Rates
SOW	: Scope of Work and Supply
TOFD	: Time-of-Flight Diffraction
TSV	: Temperature Safety Valve
UT	: Ultrasonic Testing
VMS	: Valve Material Specification

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1 GENERAL SCOPE OF WORK FOR TENDERS

This Scope of Work comprises Piping Works for the Composite Works Tender Document No. B957-999-16-43-SOW-9501 of offsites, (Mechanical Works, Painting, and Insulation), for the Bina Petrochemical & Refinery Expansion Project (BPREP) at Bina, Madhya Pradesh, of M/s Bharat Petroleum Corporation Limited (BPCL). The work shall be executed as per the Scope of Work, Scope of Material Supply, Schedule of Rates, Specifications, Standards, Drawings, and all other requirements included in the Tender Document, complete in all respects.

The composite works tender consists of Schedule of rates in two parts as follows but not limited to:

PART A

PART B

The scope of work of Offsite is to fabricate and erect the piping in the areas identified in the enclosed overall plot plan. This scope of piping is majorly in new area of development and partly in existing area of Offsite pipe racks connecting the new units such as Ethylene Cracker Unit (ECU), LLDPE/HDPE (SWING), PPU, BUTENE-1, New Tank farms, Gantry area, Existing tank farms and BDT area. This quantum of piping work is covered in Part-A and Part-B of Schedule of Rates (SOR).

Generally, the scope of work of contractor shall include the following in addition to the scope of work as defined in EIL standard specification for fabrication & erection of piping (doc. No. 6-44-0012)

1.1 Transportation of required piping materials (as described in CL.1.3), pipe support materials (as described in CL.1.6) and all other necessary piping materials from owner's storage point or Contractor's storage point (in case of Contractor's scope of supply) to work site/shop including raising store requisitions for issue of materials in the prescribed format & maintaining an account of the materials received from owner's stores & reconciliation of all Owner supplied free issue materials.

It may be noted that work shop / Field shop/Store for any material storage, Pre-fabrication, Surface preparation, Painting, coating, testing, NDT etc., may be located elsewhere inside Refinery premises or located elsewhere outside the Refinery due to space constraints. Contractor shall accordingly arrange for transport of material and the pre-fabricated spools to worksite for erection without any time and cost implication.

1.2 Clauses 2.6 of Standard Specification for fabrication and erection of piping: 6-44-0012 shall stand modified as below:

For all areas Piping GADs and Hook up sketches shall be provided to the contractor.

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Preparation of Isometrics & bill of materials for all temporary piping as per General Arrangement drawing/ Hook up sketches' requirements shall be done by the contractor. Also miscellaneous small bore lines related to instruments & pump flushing/ cooling, purging, pump vent & drain lines to CBD/OWS/SS & drain lines from LG,LT to CBD/OWS/SS, steam tracing (Non-IBR), if any, from steam supply stations up to condensate recovery station, supporting details of all Non-IBR & IBR lines up to and including 1.5" and lines specified as field routed including subsequent approval from Engineer-in-charge as and when required is in contractor's scope of work. If required, system routing & isometrics (2" & below) including branch lines 2" & below from main header at rack shall be done by the contractor. The material for all above shall be free issued.

The above lines up to and including 1.5" shall be field supported (including IBR lines- for IBR lines only the support type e.g. resting/guide/cross guide etc. shall be specified in the drawing or applicable support standards) up to the unit battery limit including approval by Engineer-in-charge, is in contractor's scope of work.

IBR Package for residual, field routed and site modified steam lines shall be prepared by the Contractor. IBR approval for the same shall be in Contractor's scope, also hook up with existing system and approval as required will be part of this scope which includes preparation of document as desired by local IBR authority

No separate payment shall be made on this account

Since the scope of the tender also involves works within, existing tank farms, existing pump houses etc., all the drawings that are issued for construction shall be verified with the site condition before start of developing the fabrication drawing. Instances where the routing indicated in the issued drawing is not feasible due to any existing facility, the same shall be brought to the notice of Engineer –in- Charge and drawings to be made to suit to site before fabrication and erection with due approval from EIL/Client without any extra cost and time.

Clause 2.7 of 6-44-0012 stands modified as under:

Contractor shall fabricate and erect the offsite piping as per GADs issued.

Contractor shall review the routing of piping thoroughly for hindrances and suggestions for avoiding the same shall be provided and approval to be taken prior to fabrication.

1.3 Piping materials, in addition to those already specified in 6-44-0012, shall also include the following but not limited to:

1.3.1 Specialty items like online filters, springs (All types), silencers, snubbers, steam and condensate manifolds, injection nozzles, MOVs, sight glass, spray nozzles, blow down valves, compact/ integrated steam traps, hoses, hose couplings, sample coolers, Expansion joint / Bellows (All types) etc.

1.3.2 Erection of Online instruments like control valve, orifice flange, rotameter, safety valves, SDVs, restriction orifice, rupture disc, de-super heaters, corrosion probes, annubar, magnetic flow meter, ultrasonic flow meter, Coriolis mass flow meters, venturi PG/PT/ Flow transmitter, ejectors, static mixers eductors, flame arrestors, thermal flow switches, fabricated hook-ups etc.

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1.3.3 Pipes (All sizes, types and schedules)

1.3.4 Flanges (All sizes, types and Pressure ratings)

1.3.5 Fittings (All sizes, types and schedules)

1.3.6 Valves (All sizes, types and ratings)

1.3.7 Gaskets (All sizes, types and ratings)

1.3.8 Studs, Nuts or M/c Bolts (all types)

1.3.9 Installation of silencers, traps, strainers, ejectors, eductors, flame arrester, sample coolers and online/ inline instruments.

1.3.10 All pipe support materials.

1.3.11 Prefabricated Piping Spools.

1.4 Shop & field fabrication and erection of piping in accordance with documents listed under CL. 2.0 i.e., 'BASIS OF WORK' including erection of all piping materials enumerated above.

1.5 **Erection of Clad Piping:** Pre-fabricated spools of clad piping shall be issued as free issue material by the owner. Transportation, erection, installation, beveling, cutting, field joint, welding, spool pipe supporting (fabrication including welding of pipe support pad), providing concrete pedestals, installation of Springs and special supports, NDT, hydro/Pneumatic testing, painting, insulation, etc. shall be in the scope of contractor. Any damage caused by contractor during transportation, shall be made good by the contractor without any time & cost implication.

1.6 Fabrication and erection of pipe supports in addition to those already specified in 6-44-0012, shall also include the following but not limited to: dummy pipes, stops, anchors, clips, cradles, hangers, turnbuckles, supporting fixtures, corrosion pads, clamps, special support, brackets, cantilevers, lubrite /graphite/PTFE low friction pads, roller supports, struts, tee-posts, erection and de locking of spring supports at all elevations after providing proper scaffolding arrangement if necessary, expansion bellows, sway braces , steam and condensate manifolds supports etc.

Reinforcing pads and stiffening rings, if not covered in the specifications/standards, shall be of the same material as of parent pipes.

1.7 Site Fabrication of piping items, in addition to those already specified in 6-44-0012, shall also include the following but not limited to:

a. Fabrication of piping specials like special radius bends, reducers, mitres, etc.

b. Fabrication of plain and threaded nipples from pipes as required during erection.

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c. Fabrication of swage nipples as and when required.

d. Fabrication of odd angle elbows like 60°, 30°, or any other angle from 90°/45° elbows as and when required.

e. Fabrication of flanges, reducing flanges, blind flanges, spectacle blinds, crosses, jump-overs etc. as and when required.

f. Fabrication of circular pipe for steam rings, fire water lines, utility lines at all levels and elevations.

g. Fabrication of branch connections with or without reinforcement.

h. Grinding of edges of pipes, fittings, flanges, etc. to match mating edges of uneven/ different thickness wherever required as per specifications including bevelling of plain end pipes. Grinding/ finishing of uneven surfaces/ joints after welding.

i. Fabrication and erection of miscellaneous items like injection nozzles, distributors etc. as per the respective sketches which shall be provided to the contractor. Contractor's scope also includes testing, commissioning of such items in all respect as directed by Engineer-In-Charge. Detailed fabrication drawings if required are to be prepared by the Contractor and submit to Owner/ EIL for Approval.

j. Design, fabrication & Installation of Sample Coolers as per EIL std drawings 7-44-0310/0311 wherever required.

k. Fabrication of chain operation arrangement of chain operated valves including chain of required length as per EIL std. 7-44-0050. All material required for this modification shall be supplied by contractor.

l. Threading (internal and external threading) of all small-bore piping as per piping material specifications.

m. Equipment nozzle reinforcement with pads, jacket & stiffeners as and when required.

n. Fabrication of injection nozzles as per details provided as and when required.

o. Tapping and drilling of holes in flanges, blind flanges, Spacer rings, piping connections for jack screw, if required.

p. Drilling on blind flange for inserting / joining small bore lines.

q. Fabrication and erection in position of funnels required for OWS/ WWS/ SS/ Condensate collection & blow down system as per direction of Engineer-in-charge.

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r. Fabrication and welding of reinforcement pads at branch pipe locations wherever required.

s. Extension of valve stem, locking arrangement of valves etc as and when required.

1.8 Hot tappings / Hot works / Cold tappings for hook-ups/modifications shall be provided as per Client requirement. Site preparation for hot work/cold tapping on the existing process/utility lines including flushing/ hydro testing, cleaning oily sludge, covering the storm water channel with tin sheets, providing hot work booth with suitable material, Standby DC Gen set, Standby crane or any other special arrangements, tools and tackles required for safe execution of hot or cold tappings etc, is in contractor's scope of work and supply. In case of Hot Tappings the specification 6-44-0021 is to be followed.

1.9 Hook-up points shall be very clearly identified with proper stenciling at site on the adjacent structure & on the respective lines. All hook-ups with the existing piping system shall be hydrotested upto the nearest isolation valve/ flange. In case it is not feasible to hydrotest as stated above, then philosophy of golden joints may be adopted, which will be done only at the discretion of Engineer-In-Charge with due NDT/ Radiography.

1.10 In case certain equipments are required to be included as a part of piping hydrotest / pneumatic test circuit, contractor's scope shall include making necessary arrangements thereof and equipment drying after hydrotest. Contractor shall take adequate care to ensure that no damage to equipment or its auxiliaries takes place during the execution of works. The rates of piping shall be inclusive of said equipment testing and separate payment shall not be made on this account.

1.11 Fabrication and erection of pipe supports shall include, but not be limited to, those specified in Clause 2.3 of 6-44-0012.

1.12 Site Fabrications of piping items, in addition to those already specified in 6-44-0012, shall also including following but not limited to:

1.12.1 Erection of Sample Coolers as per EIL Std. Dwg. No.7-44-0310/ 0311 wherever required.

1.13 Clause no 4.3.1 of standard specification for Fabrication and erection of piping 6-44-0012 shall stand modified as below;

Obtaining approval for the piping systems/ Hook up systems falling under the purviews of IBR from the statutory Indian Boiler Regulation (IBR) authority of the state where the plant is situated. The EIL/Owner shall provide documentation for IBR system. In case the local IBR authority insists that the documentation provided by the EIL/Owner is required to be submitted in any alternate format, then it will be contractor's responsibility to get the isometrics, IBR calculation etc. from the original package revised in the appropriate format as required by the local IBR authority at no extra cost. The revised package shall require Owner/ EIL approval. System isometrics or GAD required by the IBR authorities shall be made by contractor based on available isometrics.

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The contractor shall carry out the fabrications, erection and testing of this piping as per requirements of Indian Boiler Regulations and to the entire satisfaction of the Local Boiler Inspector. The Contractor shall also get the approval of IBR inspector for all fabrication and testing done by them at their own cost. All certificates of approval shall be in proper IBR forms.

1.14 IBR Package for residual, field routed and site modified steam lines shall be prepared by the Contractor. IBR approval for the same shall be in Contractor's scope. Contractor shall arrange for the inspection of the works by the statutory IBR authority and will undertake necessary coordination and liaison required and shall not be entitled to any extension of time for any delay in obtaining such approvals. Any deficiencies as pointed out by any such authority shall be rectified by the contractor within the scope of relative supply and/or work at no extra cost.

1.15 Fabrication and erection of structural arrangements like brackets, for pipe supports and valve operation / accessing some instruments etc., providing brackets from heater structure and other structures for pipe supports, modification / extension of platforms, providing additional platforms / ladders for improving / providing accessibility, including supply of necessary materials.

1.16 Providing stiffeners for all small bore (1.5" and below) branches wherever required. Material required for the same are in Contractor's scope of supply.

1.17 Modifications like providing additional cleats for extension of stem of valve, locking arrangement of valves, providing chain operation facility etc. as and when required. All materials required for these modifications shall be supplied by the contractor.

1.18 Internal grinding of welds of process lines and orifice flanges to render smooth surface.

1.19 Radiography, stress relieving, dye penetration test, magnetic particle test, wet fluorescent magnetic particle test, etc., as per specification B957-6-44-0016. In addition to this, welded reinforcing pads shall be pneumatically leak tested. Radiography requirements should include digital / conventional and Selenium based radiography methods. Digital and Selenium based radiography requirements have been provided elsewhere in this piping scope of work.

1.20 Hydraulic bolt tensioning & torquing shall be performed on flange joints as per the requirements specified in "Standard Specification for application of Torque & Hydraulic Bolt Tension for flange joints" (6-76-0002) & "addendum to the bolt tensioning and bolt tightening requirements" (B957-000-16-54-DD-1001) For determining the lines requiring torquing as per clause 5.1.2 of 6-76-0002, PMS class shall be referred. Wherever sizes / piping class are not covered in the standard specification, the applicable job specification shall be provided to successful bidder.

1.21 Wherever piping class breaks of high pressure/ low pressure are involved, the high-pressure circuit shall be tested up to piping class spec. break and the low-pressure circuit shall be done up to the nearest flange of high-pressure piping.

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1.22 Making material reconciliation statement and return of owner supplied left over materials to Owner's storage.

1.23 Pre-insulated tubing shall be free issued to mechanical contractor for erection & fabrication, as per specification and direction of Engineer-in-charge.

1.24 Electrical tracing shall be done where 'IE' is specified in P&IDs/ GADs. For electrical tracing refer requirements specified in Electrical Scope of Work documents elsewhere in the tender.

1.25 Pneumatic testing of Reinforcement pads shall also be done by the contactor. SOR item for reinforcement pads also includes pneumatic testing of the pads. Rates for Stress Relieving of welds for Reinforcement pads (for branches) shall be considered as 1.5 times size of branch pipe. Rates for Stress Relieving of Protection Shields and Corrosion Pads shall be paid for equivalent "D" which shall be calculated as "L=3.14 X D", where "L" is total weld length. Equivalent "D" shall be rounded off to the nearest size of pipe.

1.26 Making connections to underground piping systems erected by other agencies.

1.27 Erection of all online instruments & specialty items like rupture disk, venturi-tube, flame arrestor, thermal flow switch etc. except valve shall be considered as part of piping and separate payment shall not be made on this account

1.29 De-super heaters are not covered separately in the SOR. However, if the de-super heaters are of Control valve type, payment for installation of the same shall be same as for control valve of inlet line size. If the de-super heaters are venturi type, the same shall be treated as pipe for payment of its erection.

1.30 Erection of control valve (4" & above) shall be done after flushing/ chemical cleaning etc. of the erected line. For erection of piping, temporary spool pieces, fabricated from pipes (supplied by EIL) & plate flanges (supplied by contractor), shall be installed in place of control valve along with temporary gaskets (supplied by contractor).

1.31 Transportation of all safety valves from Owner's storage points to Owner's testing yard and testing them (set pressure test, leak test and back pressure test etc.) Calibration of PSV's/ TSV's shall be carried out before installation. Contractor's scope shall also include dropping/shifting of the PSV's/ TSV's from the installed position (if required) to workshop for calibration/re-calibration/re-checking, etc., and reinstall back to original location including parts replacement, gasket, stud/bolts etc., re-fixing of the PSV's/ TSV's including lapping if required to be done. This includes the PSV's/ TSV's which are installed by package vendors. The payment shall be same as control valve of inlet size only once. Erection & dismantling required for alignment, testing & re-erection shall be done at no extra cost.

1.32 Providing insert plates at all elevations with anchor fasteners in concrete structures / paved floors, providing openings for pipes in floor and repair of platform gratings around pipe openings and providing suitable members for

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support under the platform grating. Materials required for above are in Contractor's scope of supply.

1.33 Casting of concrete pedestals, fabrication and erection of small structures for pipe supports and valve operation / attending some instruments etc., providing brackets from heater structure and other structures for pipe supports, modification / extension of platforms, providing additional platforms / ladders for improving / providing accessibility, including supply of necessary materials.

1.34 Contractor shall follow the welding specification charts provided for each PMS class.

1.35 Contractor shall prepare welding specifications for all weld joints where dissimilar welding will be performed, and obtain approval from EIL.

1.36 Stiffening arrangement shall be provided for all Branches of size <= 1.5"

a) For header lines of Rating >= 600#
b) For header lines subjected to two phase flow
c) For Header lines subjected to Pulsation Flow
d) Which are PSV & TSV Inlet/Outlet purge/drain/vent connections (irrespective of line rating)
e) Which are Control Valve drains (irrespective of line rating)
f) Which are Orifice flange tapings (irrespective of line rating)
g) Which are Vents & drains
h) Which are Pressure tappings
i) Which are Temperature tapping
j) Which are Sample connections

Stiffening arrangement shall be provided with two no. of stiffeners (6MM Thk X 40 MM wide), with material equivalent to line material, at 90 deg to each other.

1.37 Contractor shall obtain all Necessary work permits from Engineer-In-Charge/ Client at site.

1.38 Contractor to ensure meeting all requirements for carrying out work in Shutdown/ Running plant.

1.39 Contactor to carry out the dismantling/modification of existing piping, if required for routing of new lines. All necessary clearances have to be taken by contractor from client.

1.40 Dismantling/ modification/ of erected piping and de-tensioning of flanges, if required for routing of lines as per revised isometrics/ GADs. All necessary clearances have to be taken by contractor from Engineer in charge. Contractor shall note that "1 Inch dia" of beveling is equal to beveling both side of the pipe components for which fit up is being made.

1.41 Inspection, Flushing and testing of all piping systems as per Standard Specification for Inspection, flushing and pressure testing of erected piping systems No. 6-44-0013. The accessories required for blinding the line like flange, blind flange, gasket (all sizes, type and rating), stud-bolts, flexible hoses

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etc. are to be arranged by the Contractor. During flushing the discharged water / air shall be drained / routed as directed by the Engineer – In Charge.

1.42 All piping must have high point vents and low point drains. P&ID & PMS requirements are to be followed for the size and type of vents and drains.

1.43 Removal, separation & disposal of insulation material, transportation of dismantled pipe, fittings, flanges, valves, pipe support etc. after flushing with air/water to owner's storage area and reconciliation of all dismantled material.

1.44 Positive Material identification shall be done in two stages: first stage during storage at EIL store or Contractor store, before fabrication and erection at site (6-82-0002) and the second stage after the installation and before hydro testing. The instruments required for PMI is to be arranged by the Contractor and handed over to EIL/Owner after completion of work in good condition. PMI as specified in Specification No.-6-82-0002 shall include the following but is not limited to the same:

A. PMI shall be done in two stages, first one during fit up/welding by contractor and another at the end by TPI agency.

B. PMI shall be done for balancing/bypass line in the alloy steel/ NACE/ hydrogen service/ CS/ SS/ DSS whenever required as per specification addition to the PMI of valves.

C. PMI shall be done for spring support clamp/cleat (if PMI is applicable for the line in which the spring is installed) and shall be recorded.

D. PMI shall be done for shoe support/corrosion pad (if PMI applicable for the line in which the support is provided.

E. PMI shall be done for RTJ gasket before insertion and shall be recorded.

F. Any other lines identified by the Engineer-in-Charge.

1.45 **Chemical Cleaning / Pickling**: Chemical cleaning shall be performed as per applicable specifications attached in the tender. The scope shall be considered from marked up P&IDs with related lines/ equipments highlighted. Supply of chemicals, consumable, DM water, piping components like pipes, flanges, fittings, valves, fasteners and gaskets required for providing temporary piping arrangement for chemical cleaning, equipment boilers, and the testing equipment required for chemical cleaning, pickling & of lines is also in the contractor's scope. Chemical cleaning has to be done as per the following specifications

- Pre Treatment Cum On-stream Cleaning of Recirculating Fresh Cooling Water System shall be as per Job Specification B957-000-06-42-CCS-001.

- Chemical cleaning of VHP/HP Steam piping shall be as per Job Specification B957-000-06-42-CCS-004

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- Chemical cleaning and passivation of compressor circuits shall be as per Job Specification B957-000-06-42-CCS-005.

- External chemical cleaning and passivation of SS welds & fittings of tanks and pipes B957-000-06-42-CCS-011.

1.46 Contractor shall supply and erect structural davits or monorails for safety valves, control valves etc., wherever required, as per operating conditions of the plant and as instructed by the Engineer-In-Charge.

1.47 For bare lines, of size two inch and above, routed on Pipe rack/ sleeper, shall have corrosion pads, the pads shall of be same metallurgy at all required locations in accordance with Job specification which shall be given to successful bidder. Welding, Stress relieving and Pneumatic testing of pads shall be provided by the contractor as required. No separate payment shall be made for the same.

1.48 Providing barricading wherever required, preventing hot gases affecting adjacent air cooler suction, work area etc., as required by EIL/BPCL.

1.49 **AS-BUILT**: Contractor shall prepare the as-built piping layout, GADs, Hook up sketches and isometrics and get it approved by Engineer In-charge. CDs/Hard Drives and hard copies of as-built drawings shall be supplied as per Special Condition of Contract. Updation of 3D model in SMART 3D version 2019 (12. 01.00.0983) as per the as-built hard copies is also in contractor scope and the same shall be approved by EIL. Software and modellers required for updation of 3D model shall be in contractor's scope. Native files of model and hardware will be provided by EIL to contractor at its office at Gurugram/ Delhi/ other EIL office. Contractor shall provide as-built GADs and isometrics extracted from the model. For the other drawings which are available/ developed in AutoCAD, as built drawing shall be updated in AutoCAD format. All the above said work are to be completed within quoted rates of piping and no separate payment shall be made on this account. Contractor shall hand over the model (native files etc.) after completion of the as-built work to EIL. The model shall not be used for any purpose other than updation as mentioned above. Contractor to ensure that the updation of all the related facilities (civil, structural, electrical, instrumentation and equipment connection) if modified, along with the updation of line routing in as built 3D modeling.

The As-Built drawing shall include the details of the other existing facilities like lines, structures, equipment etc. in the area.

1.50 For specific requirements of materials to be supplied by the contractor other than those mentioned in the technical specifications, refer general conditions of the contract, and for the Inspection and testing of contractor supplied items, refer special condition of contract.

1.51 Filling/covering of extra openings in Tech structure floors and platforms that are erected for facilitating operation of equipment and instruments.

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1.52 Piping items (e.g.-Pipes, fittings, flanges, valves etc.) in contractor scope of supply shall be procured from project approved vendor list. Approved vendor list for piping items (To be supplied by contractor) shall be provided to the successful bidder.

1.53 Providing Pre-Commissioning and commissioning assistance to owner by supply of skilled/semi-skilled/Un-skilled workers as per the direction of Engineer-in-charge with hand tools (But excluding consumables).

1.54 Providing low friction pads as specified in GADs/isometrics/special support sketches

1.55 Removal of temporary strainers before startup / commissioning as directed by Engineer In-charge.

1.56 Pre-commissioning and commissioning activities and any assistance required therein as listed below are in contractor's scope but not limited to are as follows:

a) Carry-out/Monitor water flushing followed by air drying of pipes

b) Air blowing / card board blasting of ducts & other piping systems.

c) Steam blowing / Nitrogen Purging

d) Dropping of control valve/ ROV/ MOV/ Check valve/ PSV/ Rupture Discs flanges at all elevation and reinstatement of same.

e) Dropping off in line piping instrument like orifice, venturi flow nozzle & other instrument on equipment as required and reinstatement of the same.

f) Final box up of equipment, pipeline fitting after pre-commissioning activities.

g) Carry-out leak test/tightness test & integrated leak test with soap solution or by other means.

h) Installation of temporary or permanent blind, spool piece or valve for carrying out any activities as mentioned above.

i) Attending leaks by tightening to the required torque/replacement of faulty gaskets where necessary.

j) Cleaning strainers/filters in the pump /piping circuits.

k) Supply of all temporary strainers/filters/screens required for pre-commissioning and commissioning activities

l) Topping up of bearing oil/lube oil in rotary equipment. Flushing, draining, cleaning and filling up of small hydraulic oil consoles, seals / tanks of rotary equipment.

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m) Hose connections/removal for flushing, blowing, drying, leak test or any other activities

n) Opening & box-up of piping/Vessels for demister pad cleaning & inspection.

o) Rechecking of alignments for the rotating equipment.

p) Providing skilled/semiskilled/unskilled manpower for assisting Vendor's representative for equipment preparation/minor repair/trail run and any other similar activity as per the commissioning requirement.

q) Fabrication of valve keys/blinds.

r) TPI for all bought out items

s) Removal of scrap to identified area and maintain good housekeeping in plant area to maintain safe working condition at all time.

t) Provide skilled/semiskilled/unskilled manpower for commissioning of safety systems like fire hydrants, clean agent, car sealing of safety valves, blinding/ de-blinding as required.

u) Provide manpower for checking pipe hangers/supports and setting guides for hot & cold setting.

v) To remove and reinstate inline fittings like steam traps, small in line strainers etc.

w) Make scaffolding arrangement wherever required as per safety standard and removal of the same after completion of job.

x) The flange opening & closing also include, hot loosening for easy opening and hot tightening during / after start up.

y) Cleaning of all type of steam traps for proper functioning.

z) Dropping, cleaning by means of compressed air or water jet and re-fixing the de-mister pads after inspection

aa) Cleaning and lubrication of fasteners is to be done before box-up.

bb) Brazing/replacement of wire mesh.

cc) Opening & Box up of static equipment like vessel, pipe line flanges.

dd) Isolation, removal & re fixing of Static Equipment / column/Vessel mounted instruments.

ee) Removal of insulation from piping, valves and flanges in such a way that these can be reused and fixed after completion of job.

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ff) Supplying and installation of brass target plates for use in steam blowing as required.

gg) Fabrication yard if available, shown in the overall plot plan shall be provided to the contractor. In case there is a requirement of more space contractor needs to arrange the same.

1.57 **TYPICAL TOOLS & TACKLES AND MACHINERY REQUIRED FOR PRE COMMISSIONING ACTIVITIES AND COMMISSIONING ASSISTANCE**:

The list is not exhaustive so some tools & tackles and machinery may be required to be included or excluded in scope of contractor on project specific basis. Following shall be supplied as minimum requirement along with manpower: -

a) Welding machine, TIG welding machine, electrodes, Gas cutters, Welding generator, filler wire, Diesel operated Welding Generator suitable for lighting and grinding jobs in remote area.

b) All rigging tools-tackles like Trailer, tractor trolley, hand trolley, chain pulley block of different capacity like 2.5 MT etc., ropes, material shifting trolley/push cart and wooden blocks for local movement of the material.

c) Necessary hand tools like all sizes of spanner, flange spreader, Impact wrench, & non sparking tools for working in explosive area/hydrogen handling unit. These tools must be supplied along with supplied manpower.

d) Different valve key for operating valve. These must be supplied along with supplied manpower.

e) Infrared temperature gun for measuring temperature.

f) Dewatering electric pump, temporary air compressor etc. with consumable.

g) Grinding machine, drilling machine with consumable.

h) Lifting tools like Hydra crane, assorted wire slings, web belts, D-Shackles, hook chuck.

i) Wire brushes, painting brushes, Measuring Taps & PP/Manila ropes. These can be cash procured or supplied along with supplied manpower.

j) Aluminum Ladders.

k) Condition monitoring tools for rotary equipment.

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l) Air Compressor for providing compressed air for the purpose of air blasting and flushing and any other special tools & tackles required.

1.58 TYPICAL CONSUMABLES REQUIRED FOR PRE COMMISSIONING ACTIVITIES AND COMMISSIONING ASSISTANCE

The list is not exhaustive so consumables may be required to be included or excluded in scope of contractor on project specific basis. Some of the consumables can be cash procured at site or to be supplied by contractor along with supplied manpower depending on quantum of work.

a) Required PPE for supplied manpower like cotton gloves, heat resistant gloves suitable for steam & high temperature service, gum boots, safety goggles, face shield, gas/dust mask, ear muff/ear plugs, raincoat, heat resistant aprons/jackets, safety harness, safety shoes, safety helmet and any other PPE necessary for carrying out activities safely. This is mandatory requirement and must be supplied by contractor along with supplied manpower.

b) Temporary rubber hose, fire hose etc. for flushing / pressure testing.

c) Necessary barricaders and indication tape.

d) Grease, rustoline etc.

e) Paint for temporary markup.

f) Cardboard & Temporary Gasket sheet.

g) Soap Solution & Squeeze bottles.

h) Pressure gauge for card board blasting, leak test or any other activity.

i) Emery papers, masking tape.

j) Marking Pencils

k) Electric Torch

l) Nitrogen cylinders

m) Any other consumable required, even if not mentioned etc.

1.59 **HOOK –UP OF ALL THE TIE-IN POINTS.**

Hook up works shall include the following but not be limited to:

1.59.1 The Contractor shall identify the exact location of the hook-up as per piping drawings/sketches by checking/marking exactly w.r.t site conditions and thereafter plan to execute the hook-ups. The hook up may be either, a) Branch connection on an existing line, b) Extension of tank manifold & providing a branch connection, c) Modification of an existing line & providing a branch connection, d) Extension of an existing header & providing a branch connection.

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In the absence of the availability of the piping details at the hook-up locations, the contractor can remove insulation of existing lines at these hook-up locations with prior approval from Owner/ Engineer-in-charge for finding out the details of existing piping, in order to ascertain material, size, rating etc. Insulation shall be put back properly by contractor after ascertaining of piping details. Insulation material, scaffolding etc. and whatever is required shall be in the scope of contractor.

1.59.2 Hooking-up with existing systems wherever required as per the directions of the engineer-in-charge. Hot tapping/hot work requirements of refinery/plant shall be followed wherever hot tapping/hot work is directed / required.

1.59.3 In cases where a new pipe is being hooked up with an existing piping system, the hydro testing of associated existing piping upto first isolation shall be required. In all hook-ups with the existing piping, the system shall be hydro tested upto the nearest isolation valve / flange. In case it is not feasible to hydro test as stated above then the philosophy of golden joints (i.e. 100% radiography) may be adopted. However, this shall be done only at the discretion of engineer in charge.

1.59.4 Shop/site fabrication, erection and welding of piping including flushing and hydrostatic testing, any other test etc. complete with all fittings, in line instruments etc.

1.59.5 Carrying out radiography, DP/MP test, hydrostatic, pneumatic, vacuum and other tests including the portions of existing piping, as per Job NDT Specification and standard specification for pressure and vacuum testing

1.59.6 Meeting all the safety requirements for carrying out the work during the Shutdown / operational/Running phase of plant. During Pre shutdown, the contractor shall do detailed planning & all back-up activities so that the shut-down activities can be minimized for reducing the shutdown duration. Prior to shutdown / taking up the hook-up activities the contractor shall ensure the following: -

(i) Contractor shall pre-fabricate to the maximum possible extent.
(ii) The field welds, adjustment welds shall be kept to a minimum.
(iii) Pre-fabricated parts along with loose piping components shall be tagged and kept properly. Based on the actual material requirements, contractor shall prepare shortage as well as surplus material list and provide the same to Owner/ EIL for necessary action.
(iv) Contractor shall make field engg. team which shall mark all the hook-up points and paint the lines / part of lines with the agreed colours that require dismantling.
(v) The drawings/sketches provided by the Owner/ EIL shall be verified by the Contractor as per actual site conditions before taking up prefabrication. Existing nozzle flange type, rating etc. shall also be checked.
(vi) Temporary supports required for the dismantling works shall be prefabricated to the maximum extent possible.

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(vii) Welding for prefabrication of hook-ups, Non-destructive examination, stress relieving, hardness test, insulation, painting, installation of valves for the hook-ups, pipe supporting, reinforcement pad etc. shall be treated as normal piping work and payment for these works shall be made accordingly.

1.59.7 Location of the Hook-ups shall be as per the issued hook up sketches. If - as an exception, due to the various exigencies on account of the existing functional units and tankages –, the location and arrangement of any of the hook ups are subjected to change, (with respect to the issued hook up drawing) contractor shall follow the following procedure.

At such instances Contractor shall prepare the hook up sketch as per the new location and arrangement. The same shall be submitted to the Engineer in charge for review and approval. The work on such hook ups shall be performed only after the receipt of the approval from the Engineering Division of the consultant (EIL). The preparation & submission for prior approval of the hookup sketches shall be done without any claim for extra cost & time.

1.59.8 The Contractor's scope for Hook up connections with existing lines as per process requirements/indicative sketches of hook ups/Piping GADs in the existing refinery areas shall include transportation of piping materials & all other materials from owner's storage point to worksite/shop including raising store requisitions for issue of material in the prescribed format & maintaining an account of the materials received from owner's stores & reconciliation of all Owner supplied free issue materials &consumables including support materials, fabrication of plain & threaded nipples from pipes, stub in connection with or without reinforcement, casting of concrete pedestals & fabrication & erection of small structures for pipe supports & valve operating /attending instruments etc., including supply of necessary materials, providing support for new piping, modified piping, change of existing support / additional support in existing piping as indicated in the Drawings or as required by the Engineer in charge. Statutory approval of piping wherever required, supporting, fabrication including cutting, edge preparation (inclusive of grinding the edges of pipe, fittings, flanges etc. to match the mating edges of uneven/different thickness wherever required), fit up, preheating wherever required, welding, laying, erection, cleaning & flushing by water/compressed air, non-destructive testing, positive material identification, hydrostatic test, pneumatic test or any other type of test as specified, draining, drying by compressed air, bolt torquing, flushing (including steam flushing), complete in all respects at all elevations, of all piping required for successful erection, testing & pre-commissioning, commissioning, providing all normal &special equipment & gadgets, skilled /unskilled labor, specialists, supervisory staff, operation & maintenance of plant as per the standards, specification, approved drawings, and provision of local barricading at hot work permit area at all levels and elevations as per all safety measures & instructions of Engineer-in-charge.

1.59.9 The Hook Ups shall be carried out, as per the requirement of Client/Engineer in Charge, either with the fluid on stream inside the existing line (HOT TAPPING) or after draining out of the existing line based on the availability and possibility of the obtaining a shut down for the existing line.

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If Hot Tapping is to be done, the Contractor shall supply and erect the Scaffolding required for the performance of Hot Tapping at all elevation. The Scaffolding has to be erected in such a way that two separate and independent access will be available for the temporary platforms at all elevations erected for Hot Tapping. A stand by DC Generator set shall also be made available at the location during the Hot Tapping operation in addition to the main DC Generator set from which power is consumed. A stand by crane shall also be arranged by the contractor in addition to the crane on to which the hot taping machine is being loaded, during the performance of the Hot Tapping operation. (wherever the hot tapping machine is loaded & operated from crane). If crane is not being deployed for mounting the hot tapping machine, the same shall be done only after the approval from Engineer -In-Charge. The Contractor shall supply, fabricate and erect all the structural members and arrangements required for providing 1) support to the existing line on to which the Hot Tapping is made, 2) working platform for Hot Tapping personnel & 3) Access to Hot Tapping platform where Hot Tapping personnel are deployed. Adequate fire fighting equipments shall be arranged by contractor at site for hot tapping.

Hot Tapping (the process, the technique, the materials, the consumables) shall comply to the Specification 6-44-0021. Clause no 4.2 of the same shall be strictly adhered to and no deviation from the same shall be permitted.

All machinery, equipment and consumables required for providing the Hook Ups (Hot Tapping or otherwise) like cutting machine, adaptor etc. should be arranged by contractor at the stipulated time. The Hot tapping machine shall be arranged by the contractor. The contractor shall be the single point interface for the Hot Tapping work. The downstream coordination with all the specialized agencies that the contractor will engage for Hot Tapping work shall be done by the contractor.

Piping Components like Pipes, fittings, flanges, gaskets, fasteners and valves required for providing the hook ups (except full encirclement branch tee used for Hot Tapping) shall be supplied by owner.

Thickness of the existing pipe will be taken by owner before carrying out hot tapping. Contractor should provide scaffolding /platforms and remove insulation for facilitating thickness measurement. Reinstallation of insulation after thickness measurement shall be done by the contractor. If thickness is found not satisfactory, the above detailed arrangements, for taking thickness measurement at other locations of the same pipe shall be done by the contractor.

The above are specific in nature with respect to hook-up related works.
Balance works, if any, necessary for the successful execution of the activities shall be completed as per references provided elsewhere and as per the detailed direction and supervision of the Site-engineer in charge.

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1.60 DISMANTLING WORKS:

Contractor to note that work has to be performed both in the running plant and during shutdown. The scheme of work execution shall be approved by owner / engineer in charge prior to taking up these activities in the plant. Contractor has to take utmost care & safety precautions while working in the plant. Hot Work Permits / Safety Permits for working in the plant shall have to be taken from the Owner by the Contractor. Contractor under the supervision of Owner shall carry out draining and making the lines hydrocarbon free. Contractor shall carry out work only after obtaining clearance from the Owner.

Dismantling activities are to be carried out on the basis of dismantling P&IDs & General arrangement drawings issued for dismantling, enclosed with the tender. These dismantling activities shall also be performed as per the instructions of the Owner and Engineer-in-charge.

Prior to dismantling contractor to prepare sketches / isometrics of the existing lines which are required to be dismantled and seek approval from Owner/EIL.

Contractor shall carry out dismantling/ removal works of the existing piping systems (bare/insulated/traced lines including supports) in the existing unit and retrieve/ segregate and transport the same with proper tagging (line no. & piping class etc.) to owner's storage point & stacking the materials as per requirement of Owners stores-in-charge etc. All dismantling work shall be carried out as per the drawings/ P&ID's and instructions of the Engineer-in-charge based on following guidelines:

(a) Retrieved items are the property of owner and shall be handed over to the owner after proper cleaning and tagging. No separate payment shall be made on this account.
(b) The dismantled material may be re-used as and when required and as per the instruction of Engineer-in-charge.
(c) Blinding of the retained piping shall also be carried out as per drawings and instructions of the Engineer-in-charge.
(d) While dismantling the valves (Gate, Globe, Check, PSV's, Control valves etc.) Contractor shall dismantle by cutting the matching flanges along with the valves because the same may be required for reuse along with the end flanges. While cutting with end flanges, enough care shall be taken (i.e. cutting with precision for enabling the use of end flanges after edge preparation). Valves shall be properly stacked separately at storage area.
(e) Contractor shall list out Pipe supports / structures required to be dismantled for facilitating the removal / dismantling of lines identified for dismantling.
(f) Isolation of existing line shall be done before dismantling and proper permit shall be taken for dismantling work. All safety precautions shall be taken before carrying out the job.
(g) Any damage to existing facilities like piping, painting, insulation etc. shall be rectified as per specification and no extra payment shall be made for the same.
(h) Other preparatory jobs like making the parent line Hydrogen free, blinding/ de blinding, connecting and disconnecting of hoses etc. are also the

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contractor's responsibility. No separate payment shall be made for these activities.

(i) In case of part dismantling, the line or piping or components left intact shall be properly supported and secured.

1.61 **Fire Fighting System (Above Ground)**

1.61.1 Firewater CS piping above ground shall be fabricated/ erected/ tested, etc. as per the issued isometrics / general arrangement drawings.

1.61.2 Refer elsewhere in the tender document i.e. Civil section/ Piping section for the following: -

- Supply & installation of firefighting equipments viz. double headed hydrants, landing valves, hose cabinets, portable fire extinguishers, first aid hose reel, spray nozzles etc. on the Fire water system.
-
- Providing tape coating, laying coated pipes U/G, testing the system and back filling with soil, commissioning the system etc.

- Procurement, supply, fabrication, erection of the above ground Galvanized Sprinkler Fire water system for the columns, Vessels, Pumps including the testing of the piping systems.

1.61.3 Providing insulation on the galvanized drinking water lines from drinking water header to Eye Wash and Safety Shower as per the Isometric/GADs Drinking Water System.

1.61.4 Refer elsewhere in the tender document i.e. Civil section/ Piping section for the details regarding the procurement / supply of G.I above ground piping, preparation of engineering details and fabrication & erection including testing and supporting of Above Ground drinking water piping and interconnection to Eye Wash and Safety Shower units including commissioning the system etc. within unit B/L.

1.62 **Scope at Battery Limit:**

Flushing and testing shall be carried out up to Contractor's limit shown in drawings/isometrics. The limit shown is applicable for all elevations along that coordinate. The accessories required for blinding the line with suitable plates are to be arranged by contractor. After testing the plate blind shall be cut and pipe ends shall be prepared as per piping specification. In case continuation piping (which is in the other contractor's scope) has already been hydro tested & ends have been prepared, the later contractor shall weld his piping at the battery limit, radiograph the joint at battery limit after performing hydro test of system of his portion of piping. For certain services the extent of testing may be outside the physical battery limit indicated in the layout drawings, to match the limits of the other contractor or to facilitate proper testing. Matching flange, gasket and fasteners shall be in ISBL contractor scope.

In case of interface of the contractor, with ISBL/Unit/Other agencies in Offsites is not through valve/ flange connection, the contractor shall weld a spool of required

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length (if necessary) to match with piping continued from ISBL/ Unit/ Other agency limit in Offsites–within existing Refinery, and 100 % radiograph the non-hydro tested joint with ISBL/Unit/ Other agency limit in Offsites- within existing Refinery-piping which shall be available duly beveled.

For location of the units in Bina Petchem and Refinery Expansion Project (BPREP) the overall plot plan (B957-999-81-45-00001) shall be referred.

1.63 **Digital Radiography:** The digital radiography as per requirements for the Project have been provided in the Job specification attached elsewhere in the tender). It is proposed that maximum joints shall be done by digital radiography provision. The contractor shall procure phosphorous plates and submit the radiographic files to M/s BPCL for information and retrieval. Radiography requirements(quantum) that have been provided in the piping schedule of rates includes approx. 85% Radiographic joints (40% digital radiography, 35% conventional radiography, 10% closed proximity radiography) and 15% of joints shall have provision for Ultrasonic testing techniques i.e. PAUT/TOFD - subjected to thickness requirements and approval of engineer in charge.

Digital radiographs requirements have to comply with the job specification and contractor shall submit radiographic records to Owner / EIL in digital form either in CD or Hard drive along with documentation. Broad stages of activity by vendors and contractors would be as follows:

i) Exposing Radiography image on Industrial Phosphor Plate (IPS)films
ii) Scanning IPS films & digitizing them with proper identification.
iii) Creating equipment wise/piping circuit wise Radiography soft copy files.
iv) Creating soft copy files of results interpretation by respective Inspection agency including repairs re-radiography.
v) Storing in CD or Hard drive form and submit to Owner / EIL along with final Project Documentation.

1.64 Hydro jet cleaning of mill scale, rust, foreign material, grease etc from inside of the erected piping with 20000 PSI Hydro jetting machine, power lance and other accessories as per requirement. All the works required for carrying out the hydro jetting like dropping of valves, plugging of open ends, dewatering to nearest stormwater drain etc. Making arrangement for hydro jetting at all elevation shall be in contractor's scope.

Roto-mol cleaning for critical piping shall be done by contractor to achieve the required finish. All required machineries, pumps, compressors, tools and tackles, attachments, facilities, etc shall be arranged by the contractor, as directed by Engineer-in-charge.

Cleaning shall be followed up with borescopy for checking the cleanliness inside the pipe. Contractor has to offer borescopy of the lines to Owner/EIL, ensuring satisfactory internal cleaning of lines.

All spading, de-spading, erection/dismantling of scaffolding, all tools and tackles, Farhana, Roto-mol Machine, borescopy machine, Cables from nearest 440V socket, panel and all other accessories including hose connection jobs required for successful completion of job is in the scope of contractor.

1.65 Fabrication/ erection of support structures (T-posts, U-portals, inverted U portals) for routing the lines, avoiding the interference with existing facilities like Fire water Piping, underground OWS/ CRWS/ BLOWDOWN system Piping,

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electrical & instrumentation cable routes. The contractor shall prepare, and submit for review and approval, the drawing of the support structures planned (if the routing as per the drawing issued to the contractor is fouling with any existing facility). The drawing, should indicate the North-South & East-West Co-ordinates of the support structure along with the support level elevation (TOS). The fabrication and installation of the support structure shall be done only after the award of acceptance from the consultant's (EIL) Engineering division.

1.66 Contractor shall install requisite nos. of necessary review software (e.g. Navisworks) for viewing 3-D models at site by his representative at site. The subject model may be arranged by contractor from site Engineer-In-Charge on a mutually agreed time frame (e.g. weekly).

1.67 Contractor shall deploy software for piping construction management & fabrication spool management. Software used for fabrication and spool management should be compatible with the S3D. It should be able to interpret IDF files created by S3D and generate piping MTO, isometrics with weld joint numbers, fabrication spool and erection drawings indicating construction work load. The software should be able to handle revision management seamlessly.

1.68 Works for Piping Erection shall involve works inside existing culverts, with in existing pipe racks (between two tires) etc., and bidder to engage agencies conversant with working in confined areas.

1.69 Bidder to note that since the works are also involved inside BPCL Refinery & within existing functional units and building areas- the working area is very congested. Erection and fabrication may be very difficult. Therefore, it is in the interest of the bidder, that site visit may be made to accesses the works.

1.70 Box up of Non Hydrotested Flange Joints are also in contractor's scope. The rates for the same shall be inclusive of the rates considered for erection and fabrication.

1.71 Fabrication, supply and erection of rain protection cover for doing welding jobs during rains. The contractor should use rain protection cover for welding during rains.

1.72 Ultra Sonic testing shall be done for welded joints if instructed by RCM /Site-In-Charge and as per specifications.

1.73 If PWHT is done for the line, hardness test shall be done for all the welds in the line, including fillet weld joints also. The rates for stress relieving shall be inclusive the rates for the stress relieving of the attachment welds and the hardness tests.

1.74 If PWHT is done for the line then hardness test shall be done for the attachment welds also including those of pipe supports like shoes, trunnions, dummy supports, pads etc.

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1.75 For Austenitic and duplex stainless steel ferrite number checking of weld joints shall be done using ferritoscope and shall be reported. The rates quoted for fabrication of Stainless-Steel metallurgy shall be inclusive of the same.

1.76 The rate quoted for the erection of valves shall take into account the erection of valves at higher elevations also.

1.77 No separate rate shall be claimed for Post heating and the same shall be part of the rates quoted for the items under the head Piping Above Ground.

1.78 For the items under the head MODIFICATION/ EXTRA WORKS (IF ANY) in SOR the rates quoted shall be inclusive of the rates for, Cleaning & flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified draining, drying by compressed air, performing Positive Material Identification(PMI) using alloy analysers, completing all such works in all respects (including preparation of isometrics as mentioned in the Scope of Work for the job) as per the specifications, drawings and instructions of Engineer-in-Charge. PMI after such modifications shall be done by TPI agency. The rate quoted for the modification of tubing shall include rates for valves, fittings, all in line instruments and testing etc. The rates for modification of Carbon Steel Piping includes the rates for LTCS modifications also. If beveling is to be done as part of the modifications the payments shall be made as per the number of joints and not as per the number of faces for which beveling is done.

1.79 “Warning/Danger “Tag Stenciling shall be done throughout Electrically traced lines.

1.80 Fabrication, erection, painting & insulation of piping in the packages which are to be done by Mechanical contractor. Contractor shall also facilitate the work of different other package vendors for successful mechanical completion.

1.81 Any damage to Painting and insulation on the existing equipment and piping shall be made good by the Contractor. The EIL specifications for Insulation & Painting shall be followed in such cases

1.82 Contractor shall deploy store management software.

1.83 Spool identification & Spool storage location shall be managed through RFID and barcode scanning and tracking system. Programme should facilitate fully automatic barcode printing using mobile printers. High range barcode scanner shall be integrated with the system.

1.84 Spool searching with RFID: -Searching fabricated spool in lay down area shall be achieved with the use of RFID & scanners through spool search software modules. Identification of spool shall be indicated using beep alarm audio. Proximity of the searching spool shall be indicated graphically in the scanner.

1.85 The extent and quantum of modification /dismantling & relocation of existing facilities are to be properly accessed by the bidder. Bidder’s representatives shall undertake site verification of the relevant areas in the existing Bina Refinery to quote the rates accordingly.

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1.86 For lines routed at grade level, (on sleeper) the road crossing and the crossing of the lines beneath existing piping and other existing facilities shall be through pipe way bridges or pipe trenches. The pipe way bridges and trenches shall be constructed by other agencies. Contractor shall liaison & coordinate with other agencies with respect to the pipe support level elevations.

Instances where there are only one or two lines to be routed across roads/ beneath existing facilities, the same may be through sleeves. The same shall be as per the issued for construction drawings. The fabrication and installation of pipe sleeve along with the guiding arrangement as per 7-44-0404 shall be done by the contractor.

The excavation & the back filling of the soil and the re-establishment of the road once the pipe crossing through sleeve is complete, shall be done by the contractor. Refer Civil part for details of the same elsewhere in the tender.

1.87 **Package units:** For the several package units (e.g. Compressed air package, Steam Generation package etc.) the scope includes handling and transportation of all piping materials (including loose-supply pipes, fittings, valves etc. and prefabricated piping spools) from the Owner's storage point to the work site; fabrication (shop and field welding), erection, and support of all lines/piping, including interconnections between skids/modules, in accordance with Isometric drawings, GADs, P&IDs, applicable standards, and specifications, including field adjustments such as cutting and welding of prefabricated spools wherever required; alignment and support of piping spools at all levels and elevations on above-ground structures, followed by welding after laying; installation of flanges, tapping for pressure and temperature gauges, and all other online instruments as required, including all line-mounted valves, fittings, and instruments; hydrotesting of the system, flushing, and drying of pipes with compressed air; painting and insulation of piping as applicable as per standards and job specifications; and completion of all works as per the instructions of the Engineer-in-Charge, including returning all unused or scrap pipes to the Owner's storage point.

Special care shall be taken for the erection and installation of interconnecting piping between equipment/skids, within the skid, and for piping to/from the battery limit for connections within the package boundary, as per the requirements of the Licensor.

Payment for Fabrication, erection, prefabricated spool erection, NDT, Valve erection, supports, Painting, Insulation, pre commissioning works etc. shall be made based on the respective item rates specified in the SOR. The basis of the work shall be as per Licensor's P&IDs, EIL P&IDs, Package layout/plot plan, Isometric/GADs, Specifications, standards etc.

In case of discrepancies found in any term, standards, specification and references, the most stringent clause shall be applicable, as per the discretion of Engineer in charge.

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2 BASIS FOR WORK

The basis of work shall be read in conjunction with standard specification for fabrication and erection of piping, 6-44-012. Additionally, the following documents shall be referred. The complete piping works shall be carried out in accordance with the following but not limited to the same:

2.1 'Approved for construction' drawings and sketches issued by EIL to the Contractor- Plans (General Arrangement Drawings) and/or Isometrics / system isometrics.

2.2 Drawings, sketches and documents prepared by Contractor duly approved by Engineer-in-charge. (Such as isometrics of small bore pipes in contractor's scope (refer clause 1.2) and lines required to be field routed etc.)

2.3 Specifications / Documents as below:

a) Piping and Instrumentation Diagram (P&ID).

b) Piping Material Specification (B957-6-44-0005) along with General notes & annexures.

c) Piping Support Standards and special support sketches as applicable.

d) Line schedule.

e) Job Specification of Non-Destructive Examination Requirement of Piping (B957-6-44-0016)

f) Job welding specification charts for piping (B957-999-6-41-WSC-0001).

g) Piping Standard Specification for inspection, flushing and testing piping system 6-44-0013.

h) Welding specification for fabrication of piping 6-77-0001

i) Any other EIL or other specification, including job specifications, attached with Piping Material Specification or elsewhere and special conditions of contract (such as standard for dimensional tolerances etc.).

j) Procedure for storage, preservation and positive identification of materials at Contractors works/ stores. Preservation team with one supervisor to be deployed.

k) Standard Spec for application of torque & hydraulic bolt tension for flange joints (6-76-0002). The classes/sizes not covered by this specification shall be given to successful bidder subsequently

l) Painting, color coding, surface preparation etc. shall be as per Job Specification for surface preparation & protective coating doc no. B957-000-06-42-PLS-0001.

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m) Standard specification for hot insulation of vessels, piping, equipments 6-79-0026

n) Specification for Digital Radiography Requirements B957-6-44-0016.

o) Job Specification for Pretreatment Cum On stream cleaning of Recirculating fresh cooling water system, B957-000-06-42-CCS-001.

p) Job Specification for chemical cleaning of VHP/HP B957-000-06-42-CCS-004.

q) Job Specification for chemical cleaning & passivation of compressor circuits B957-000-06-42-CCS-005.

r) Job Specification for external chemical cleaning and passivation of SS welds & fittings of tanks and pipes B957-000-06-42-CCS-011.

s) Marked Up P&ID for Chemical cleaning

t) Contractor shall implement software for piping construction management as per job specification, that shall be given to successful bidder.

u) P&IDs for fire water system

v) ISO-17636-1: Non destructive testing of welds / radiographic testing, X- ray & gamma ray, techniques with film.

w) ISO-17636-2: Non destructive testing of welds/radiographic testing, X – ray & gamma ray techniques with digital detectors.

x) Specification for Hot Taping 6-44-0021.

y) All documents, specifications, standards that are attached or referred elsewhere in the tender.

2.4 Following Codes, Standards and Regulations:

i.	ASME B 31.3	Process Piping
ii.	ASME Sec.VIII	Code for Unfired Pressure Vessel.
iii.	IBR	IBR Regulations
iv.	IS: 823	Code for Procedure for Manual Metal Arc Welding of Mild Steel (for structural steel).
v.	ASME Sec. V	Boiler and Pressure Vessel Code

All the codes referred above shall be of the latest edition, at the time of award of contract.

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3 SCOPE OF SUPPLY FOR TENDER (PIPING)

3.1 OWNER'S SCOPE OF SUPPLY

a) Pipes (All sizes, types and schedules in random lengths)

b) Flanges (All sizes, types and Pressure ratings)

c) Fittings (All sizes, types and schedules)

d) Valves (All sizes, types and ratings)

e) Gaskets (All sizes, types and ratings)

f) Studs, Nuts or M/c Bolts (all types) except structural bolting.

g) Spring, Expansion joint / Bellows (All types), struts, sway braces etc.

h) Specialty items like sample coolers, MOVs, steam supply and condensate manifold, integrated steam traps, injection nozzles, strainers, spray nozzles, air traps, hose pipes and hose couplings, CPV fittings& valves, Victaulic snap couplings, corrosion coupon/probes, silencers, snubbers, sight glass etc.

i) Online instruments like Control Valve, SDVs, Orifice flange, Annubar, Magnetic Flow meter, Restriction Orifice, Ultrasonic flow meter, Rotameter, Rupture disc, Safety Valve, De-super heater, PG/PT/Flow transmitter etc.

j) Pipes for supporting of Piping such as dummy pipe, RF pad, saddle, corrosion pad/protection shield fabricated from pipe.

However, pipes/ fittings/ flanges/ gaskets/ fasteners/ valves related to galvanized piping (for fire water & drinking water system) are not included in owner's scope of supply and the same shall be supplied by the contractor.

3.2 CONTRACTOR'S SCOPE OF SUPPLY

The procurement and supply in sequence and at appropriate time of all materials and consumables required for the completion of the works & Pre-commissioning shall be the responsibility of the contractor and prices quoted shall be deemed to be inclusive of such materials.

The supply of these materials shall include but not limited to the following:

a) Tools, tackles and machinery required for cutting, fitting, welding, brazing, cleaning, grinding, threading, bolt tensioning. All equipments (like torque wrench and hydraulic bolt tensioning equipments) required to tighten the flange joints to desired level.

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b) Contractor shall provide all measuring, testing and other tools required to complete mechanical jobs as directed by Engineer-In-Charge, including specialized instruments.

c) All industrial gases such as oxygen, acetylene, inert gases, all types of electrodes, filler wire, flux wire, brushes, etc.

d) Shims, wedges, and packing plates (machined wherever required).

e) All materials such as hydraulic pumps, metallic blinds, temporary gaskets etc. and arrangement required for pressure testing and pneumatic testing.

f) Arrangement for compressed air, blinds, temporary gaskets etc. and arrangement required for pneumatic pressure testing including suitable compressor. Compressor for pneumatic testing shall be suitable for testing the lines at 7 to 8 Kg/cm2g pressure

g) Certified scaffolding inspectors shall be deployed. Scaffolding materials shall be certified and Area-wise scaffolding teams to be segregated for better control.

h) Contractor shall deploy a dedicated housekeeping team, in two or three shifts (covering 24 Hours), with supervisor throughout contract execution.

i) A proper tool box with racks shall be prepared for storage and organization of special tools provided by equipment vendors.

j) All materials and arrangement required for all types of non-destructive tests such as radiography, dye-penetrant, magnetic particle and wet fluorescent test, Pneumatic Testing for reinforcement pad, PMI instruments etc.

k) Arrangement & supply of chemicals, consumables, DM Water, equipments, boilers, coupons, piping components (like pipes, flanges, fittings, valves fasteners and gaskets) required to provide temporary connections for chemical cleaning, and other testing equipments required for chemical cleaning, pickling & passivation of lines. The contractors shall submit the proposed circuits which shall be duly approved by EIL.

l) All sealing and protecting materials required for protecting materials/equipments supplied by owner/contractor.

m) Oil, grease, graphite, Teflon pads, molykote, sealing tapes, cleaning agents including acids for cleaning of internals/packing/trough/tray etc.

n) Suitable material and water hoses for fire and safety protection as required.

o) Chain pulley block, davit and all other material handling equipments as per requirements.

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p) All safety equipments required to conduct the job and avoid accident and keep good housekeeping and environment.

q) Supply, fabrication, welding of hot dip galvanized plates, for earth wire lug connection required for earthing of pipes.

r) All consumables and materials required for fire fighting system other than supplied by Owner as free issue.

s) Tape / Tape coating material for U/G piping as required.

t) Wherever valves require extended spindle, the valves have been generally procured with extended spindle. If anywhere if the same is not procured/available then the extended spindle shall be provided by the contractor. The arrangement for the extended spindle shall be prepared by Contractor and submitted to Engineer-in-charge for approval.

u) All grouting material required and specified as per EIL Specification, drawings and two sets of instructions of the Engineer-in-charge.

v) Equipment and instruments for hydraulic bolt tensioning (complete set) & PMI. Contractor shall hand over one complete set of hydraulic bolt tensioning equipment and Two (2) sets each (Pneumatic and Manual) of torque wrenches and socket sets covering all plant fastener sizes (in mm and inches) to Owner after commissioning of the plant. The instruments with which PMI is done shall be handed over to Owner after completion of work in good working condition.

w) All tools and tackles required for assistance in pre-commissioning/commissioning.

x) Structural steel required for modifications/ extension of platform, providing additional platforms, ladders, jumpovers etc. to improve accessibility, wherever required.

y) Paints Materials etc. which are under contractor's Scope of supply will require the approval of EIL / OWNER with necessary required tests at no extra cost.

z) All equipment/instruments required for hydro testing /pneumatic testing/ blinding / de-blinding / flushing etc.

aa) Safety net & Fall arrester.

bb) Cranes/hydra/other lifting tools required for erection

cc) MS Tube, Bolts / Anchor fasteners, nuts, washers, spring washer including hangers, U-bolts with nuts, clamps, graphite and Teflon pads, angles, beams, channels etc. for pipe supports, platforms, ladders, stairways and for all

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miscellaneous steel structure, supporting steel plates, wires, and strips. However, for spring hangers entire spring assembly shall be supplied by Owner.

dd) Plate flanges for fabricating temporary spool pieces for use in place of control valve (4" & above) including temporary gaskets

ee) Supply of MS flats, chequered plates, & flat bar.

ff) All material and arrangement required for stress relieving.

gg) All safety equipment required for safe conduct the job, avoid accidents and keep good housekeeping and environment

hh) Supply fabrication, etc. of hot dip galvanized plates, for earth wire lug connection required for earthling of pipes/

ii) Supply of cold galvanizing or zinc coating material with approval of Engineer In charge.

jj) Bird screens at the outlet of lines open to atmosphere.

kk) Low friction pads like Teflon/graphite pads with suitable bonding material/fastener.

ll) Supply of all material required for fabrication of funnels for OWS system, bearing cooling water and back flushing requirement as required per drawings/P&IDs as per EIL'Std and instruction of the Engineer-in-charge.

mm) Supply of all structural steel required for fabrication of pipe supports.

nn) All materials like cellular glass, PUF, PIC, Rock wool, Aerogel etc., required for Isolation of Pipe supports from Structural members, wherever specified in Isometric and as per special support sketch.

oo) Contractor shall bring in their own Lifting Tools & Tackles for equipments lifting, erection of Piping, Piping specials, Valves, Equipments, etc., The lifting tools & tackles being deployed for erection activities shall be of good quality and possess valid certification from appropriate authorities with respect to the SWL of each of them. Contractor shall take back all their lifting tools & tackles, after completion of the entire works as per the scope of contract. Supply of all items required for erection comprising of:

i. Manually operated ground winch
ii. Hoisting rope
iii. Direction pulley on ground, Guide pulleys
iv. Motor for hoisting rope, along with fixing bolts and structural support members, as required.
v. Thimble for fastening hoisting rope to lifting beam.
vi. Supports for ground winch and direction pulley with foundation bolts, as necessary.

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vii. Welding/fixing of bearing brackets on the platform and support arms on the stack.

viii. Structural members as necessary for supporting the guides for lifting beam during lowering/hoisting.

ix. Tip lowering/hoisting guides.

pp) All other materials though not specified above but required for completion of the work as per specification, drawings and instructions of the Engineer-in-charge.

qq) Flange spreader required for making the gap between flanges while inserting blinds or for changing gaskets shall be arranged and made available by contractor. The rates quoted for fabrication and erection of above ground piping shall be inclusive of the same.

rr) Temporary gaskets required for hydro testing of lines and equipment after blinding the equipment nozzles and flange joints are to be supplied by the contractor. The gasket shall be asbestos free. The rates quoted for fabrication and erection of above ground piping shall be inclusive of the same.

ss) Supply of Galvanized Pipes, Fittings, Flanges and associated Gaskets, bolts and nuts as per Piping Material Specification – Piping Class – J2A/J95A for firefighting systems as well as drinking water lines to eye wash and safety shower units including galvanizing of the damaged piping as per the instructions of the Engineer-in-charge.

tt) Supply of all materials for glass flake epoxy lining, painting and insulation.

uu) Contractor to note that close proximity radiography with “Radiography with Selenium-75 source using safe radiation technique” as per Exhibit-H of Job specification, B957-000-06-41-WSP-0001 is also required to be used, hence the scope includes arranging of equipment and all necessary items required for work and specifically not mentioned above but required to complete the work in all respects and as per the directions of the site engineer-in-charge.

vv) For hook ups with existing lines, which are to be executed with the fluid on the stream, in the existing line (HOT TAPPING) , the scope of supply of the full encirclement hot tapping fitting , (split tee) is with the contractor .The material of construction of the split tee shall be as per the respective hook up drawing .The isolation valve, flanges & pipe required for the fabrication of the hook up shall be provided as free issue to the contractor .The full encirclement split tee shall be of two piece construction .The two piece construction shall be either a) split in to two equal halves through the branch or b) split longitudinally through the run of the pipe perpendicular to the branch . The material of the Split tee shall be certified in Material Test Certificate (MTC) of accredited labs.

ww) The structural components required for the fabrication of the hook ups (hot tapping or otherwise) are to be supplied by the contractor.

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xx) All special machinery and equipments and tool and tackles required for the execution of the hot tapping hook up are to be supplied by the contractor.

yy) Refer Electrical section of the tender for the scope of supply for electrical tracing.

4.0 SCOPE OF WORK (PAINTING)

The scope of work broadly consists of painting of piping, inline items, pipe supports and structural steel work for pipe supports as detailed in schedule of rates as per drawings, specification for Standard Specification for surface preparation & protective coating, doc no. B957-000-06-42-PLS-0001 and instructions of Engineer-in-charge.

The scope of work shall consist of surface preparation as required, selection and application of required paints on surfaces of piping, inline items, pipe supports and structural steel work for pipe supports etc. including but not limited to painting of piping in packages (erection by others) shall also include in scope of work of Mechanical contractor.

The scope of work shall be as per Schedule of Rates (SOR) but not limited to:

(i) All un-insulated piping and fittings including flanges and valves (Including providing identification marks) and Instrument impulse lines.

(ii) All equipments like columns, vessels, Heat Exchangers, filters, Skid mounted equipments, pumps etc. and other miscellaneous equipments as specified.

(iii) The painting activity may include painting of prefabricated piping spools and piping other than prefabricated spools. The prefabricated piping spools shall be supplied to the contractor with pre-erection/ shop primer painted and only the post erection/ field painting shall be done by the contractor after repair of pre-erection/shop primer after erection/welding.

(iv) Coating system as per Sr. 11.1.1 of EIL specification B957-000-06-42-PLS-01 Rev. 2 shall also be applicable for design temperature range of -47 deg C.

(v) For the piping other than prefabricated spools, the contractor shall carry out the complete painting as per procedure including the surface preparation, Pre-erection/Shop Primer application and the post erection/ field painting including the repair of pre-erection/pre-fabrication or Shop Primer after erection/ welding

(vi) All structural steel work including pipe rack, trestles, compressor house, flood light masts, flare trestle structure, walkways, handrails, pipe supports, ladders, technological structures etc. as per painting specification but excluding those members which are to be fire proofed.

(vii) Painting of surfaces to be insulated as per requirement.

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(viii) Any other surface as directed by Engineer-in-charge including all surfaces.

(ix) Identification, color bands on all painted surface of equipments/piping. Color coding shall be carried out as per Job Specification for surface preparation & protective coating, doc no. B957-000-06-42-PLS-0001/Client's specification. In case of any doubt / ambiguity on the color codes, the owner's / EIL decision shall prevail.

(x) Identification lettering / numbering on all painted surface of equipment, piping, including color bands on all painted surface of equipment / piping. Color coding shall be carried out as per Job specification B957-000-06-42-PLS-0001/ Client's specification.

(xi) Hazardous content marking / identification signs on painted surface of equipments / piping.

(xii) Cleaning up the working areas regularly during the course of work for purpose of good housekeeping as well as cleaning up the site on completion of the work as directed by the Engineer-in-charge.

(xiii) Providing scaffolding for all heights, all other incidental / auxiliary / ancillary / accessories, labor, material, tools and tackles / consumables, supervision etc. or any enabling work not specifically mentioned in the specifications but necessary for the execution and completion of work as envisaged in the tender document.

(xiv) Fire Water CS piping above-ground shall be painted as per specification.

(xv) The quantum and scope of painting shall be assessed by the bidder themselves based on drawings and documents such as P&IDs, Line lists, typical drawings, hook-up drawings and other documents and specifications. However complete painting works are necessary shall be in the scope of the contractor.

(xvi) Repainting of the existing piping exposed/ spoiled while making hook-ups, damage of any pipe during erection, fabrication or movement of contractor's crane/ equipments etc.

(xvii) Repainting of the lines/ headers of hook-up or adjacent line affected during hook-up.

(xviii) Scaffolding for all heights, all other incidental / auxiliary / ancillary / accessory or any enabling work/materials not specifically mentioned in the specifications but necessary for the execution and completion of work as envisaged in the tender document.

(xix) If the finish paint is applied to the Piping components at the fabrication yard and in the event of damage to the same during erection and field welding the same shall be repaired and the original DFT shall be maintained

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(xx) The surface preparation, primer coating and finish coat of all the relocated & modified existing facilities are in the contractor's scope.

5.0 SCOPE OF SUPPLY (PAINTING)

5.1 OWNER'S SCOPE OF SUPPLY

NIL

5.2 CONTRACTOR'S SCOPE OF SUPPLY

The procurement and supply in sequence and at appropriate time of all materials and consumables required for the completion of the works shall be the responsibility of the contractor and prices quoted shall be deemed to be inclusive of such materials.

The supply of these materials shall include but not limited to the following:

- All primers and finish paints as per paining specification.
- All equipments for surface preparation & touch-up primer.
- All consumable for surface preparation & touch-up primer.
- All equipments for paint application like brushes, spray nozzles, spray Pumps/blowers etc.
- All equipments like dust collector, protection shield etc. for conducting the job.
- All consumables and equipments required for job completion at all elevation and at any location.
- Any other consumables and equipments required to complete the job as per drawings, specifications and instructions of Engineer-in-Charge, at all elevations and locations is under Contractor's scope.

6.0 SCOPE OF WORK (INSULATION – HOT AND COLD)

The scope of work shall include hot Insulation, safety insulation including metal cage, vessels, exchangers, piping, valve & flange assemblies, instrument impulse / lines etc. as detailed in schedule of rates and as per this document and as per Standard Specification no. 6-79-0026 for hot Insulation of vessels, piping & equipment. The insulated lines may undergo painting as per specification no. B957-000-06-42-PLS-0001 and for special insulations as per Job Spec: B957-999-06-43-IL02. Wherever B957-420-06-43-IL01 is mentioned, contractor to read this as B957-999-06-43-IL02

The work in brief shall include the following but not limited to the following: -

Scope of work includes supply/erection of insulation for lines and equipment in Tank farm area, Road gantry, Rail Gantry, BDT area, Mounded Bullet area etc. within offsite.

(i) Supply of all insulation and ancillary material like spacer-ring, stays, lacing and binding wires, screws, bands, felt, studs, flats, support ring clips, sealant and mastic, cement, glass cloth, aluminum sheets/ GI sheets necessary drillings and fixing of bolts/nuts, washers etc., wherever specified and required. All insulation material shall be new and of

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approved quality with complete test certificates and in accordance with the specifications.

(ii) Application of insulation with weather proofing on vessels, columns, Package Equipments, equipments like filters, Heat Exchangers and piping including valves, flanges etc. and instrumentation as per specifications and instructions of Engineer-in-charge.

(iii) Insulation of any other surface as per instruction of Engineer-in-charge.

(iv) Providing scaffolding for all heights, all other incidental/auxiliary /ancillary/accessories, labour, material, tools and tackles / consumables, supervision etc. or any enabling work not specifically mentioned in the specifications but necessary for the execution and completion of work as envisaged in the tender document.

(v) Providing besides all materials and consumables labour and supervision required for carrying out the insulation work, all safety devices, equipments, apparatuses, instruments etc. necessary and incidental requirements to perform the work in workmanship and efficient manner within the stipulated time period.

(vi) Color coding, identification of equipments, vessels, heat exchangers, process column, piping, instruments etc. after insulation as per painting specification and instruction of Engineer-in-charge.

(vii) Proper storage and protection of insulation material and consumables brought to site by the contractor at all stages of work.

(viii) Providing insulation plugs and windows at all locations as per drawings, specifications and instructions of Engineer-in-charge.

(ix) Keeping the working area clean and tidy during course of execution and cleaning the work site to the full satisfaction of the engineer-in-charge after completion of work.

(x) Any other incidental/intermediate/ancillary or any enabling work/materials not specifically mentioned in the specifications but necessary for the execution and completion of work as envisaged in the tender document.

(xi) Certain equipment and piping require chain guards, screens for personnel protection etc. because insulation cannot be provided directly on the equipment/ piping. Contractor shall provide the same as per approved drawings and instructions of Engineer-in-charge.

(xii) Any lines requiring dismantling of the insulation for inspection / repair / maintenance, erection of any other equipment shall be done by contractor and again secured back in place after completion of the subject activity.

(xiii) Supply of paint and Color coding identification of equipments, vessels, heat exchangers, process column, piping, instruments etc. after insulation

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as per relevant specification 6-82-0003/ Client's specification and instruction of Engineer-in-charge.

(xiv) Any line which Owner feels requires insulation during the process of commissioning shall also be done by contractor.

(xv) Painting of surfaces which require painting under insulation is also in contractor's scope.

(xvi) Chloride content in the insulation used for SS pipeline to be checked and low chloride insulation used for SS pipeline shall be stored separately to avoid mix up

(xvii) The actual quantum and scope of work of insulation shall be assessed by the bidder based on drawings and documents such as P&ID's, line list, GAD's, isometrics and other relevant documents and specifications. However complete insulation work necessary shall be in the scope of the Contractor

(xviii) "Warning/Danger" tag stenciling shall be done throughout electrically traced lines

(xix) Restoration of the insulation, with new insulation materials for all the locations where in the insulation over existing lines have been removed for executing hook ups

(xx) Providing insulation with new insulation material for all the locations where modification and relocation has been done in existing facilities.

7.0 SCOPE OFSUPPLY FOR INSULATION TENDER (PIPING)

7.1 OWNER'S SCOPE OF SUPPLY: NIL

7.2 CONTRACTOR'S SCOPE OF SUPPLY

The procurement and supply in sequence and at appropriate time of all materials and consumables required for the completion of Insulation and Painting (Color coding identification) works shall be the responsibility of the contractor and prices quoted shall be deemed to be inclusive of such materials. undergo painting as per specification no. B957-000-06-42-PLS-0001.

The supply of these materials shall include but not limited to the following:

a. All items required to complete Insulation (Insulation material, attachment material, fixing materials, vapor barrier material, bolting, screws, inspection window, structural attachment, material for color coding identification etc.) as per EIL standards, specifications and instructions of Engineer-in-charge.

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b. All consumables and equipments which is required for job completion at all elevations and any location.
c. All sealing and protecting materials required for protecting materials/equipments supplied by Owner/ Contractor.

d. Wooden Blocks, High Density PUF blocks, cellular glass for providing cold insulation and supporting of cold insulated lines.

e. Aluminum foils for cold insulated lines of Stainless Surfaces

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8.0 LIST OF APPLICABLE STANDARDS / SPECIFICATIONS / DRAWINGS:

S.No.	TITLE	Document No.
JOB SPECIFICATIONS & STANDARDS		
1.	Piping Material Specification	B957-6-44-0005***
2.	Addendum to the bolt tensioning and bolt tightening requirements.**	B957-000-16-54-DD-1002**
3.	Job Specification for Non Destructive Examination Requirement of Piping	B957-6-44-0016***
4.	Welding Specification Charts for piping classes	B957-999-6-41-WSC-0001
5.	Job specification for degreasing of carbon steel piping, Vessels & Equipment in amine service.	B957-000-06-42-CCS-003
6.	Job specification for Pre-Treatment cum on stream cleaning of re-circulating fresh cooling water system.	B957-000-06-42-CCS-001
7.	Job Specification for external chemical Cleaning and passivation of SS welds and fittings of tanks and pipes	B957-000-06-42-CCS-011
8.	Specification For Surface Preparation and protective coating system-new construction	B957-000-06-42-PLS-01
9.	Welding Specification for fabrication of piping	B957-999-06-41-WSP-0001
INSPECTION & TEST PLAN		
1.	Inspection & test plan for welded Pipes	6-81-0002
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S.No.	TITLE	Document No.
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S.No.	TITLE	Document No.
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2.	Annexure-1 Steam tracing (Typical Diagrams).	6-44-0007-A1
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4.	Standard Specification For Fabrication & Erection Of Piping	6-44-0012
5.	Standard Specification For Inspection, Flushing And Testing Of Piping Systems	6-44-0013
6.	Standard Specification for Hot Tapping on Piping	6-44-0021
7.	Technical Notes for Pipes	6-44-0051
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17.	Standard specification for hot insulation of vessels, piping and equipment	6-79-0026
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19.	Standard Specification for Positive Material Identification (PMI) at Vendor's work	6-81-0001
20.	Standard Specification for Positive Material Identification (PMI) at Construction Sites	6-82-0002
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S.No.	TITLE	Document No.
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3.	Hook Up Sketches**	
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2.	Chemical cleaning of VHP/HP Steam piping shall be as per Job Specification	B957-000-06-42-CCS-004
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4.	External chemical cleaning and passivation of SS welds & fittings of tanks and pipes.	B957-000-06-42-CCS-011

Notes: * Overall Plot Plan and Area Division drawing is attached for reference. Execution shall be as per latest revision of GADs which shall be given to successful bidder.

** Shall be given to successful bidder.

*** Updated PMS , updated PMS General Notes , updated NDT specification, for additional piping classes (if any) , & updated addendum for bolt tensioning shall be given to successful bidder

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SCOPE OF WORKS & SUPPLY
(GENERAL CIVIL)

Tender No. : B957-999-69-41-PK-T-9501-A

(COMPOSITE WORKS U&O)

PART-A (WEST SIDE) &PART-B (EAST SIDE)

PROJECT	:	**BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP PROJECT)**
OWNER	:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC / EPCM	:	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	:	**B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	17.03.2026	ISSUED FOR TENDER	BP	NS	AK

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1.0 SCOPE OF WORK

The scope of work under this contract in general shall include Construction of all relevant Composite works for Bina Petrochemical & Refinery Expansion Project (BPREP) at Bina, Madhya Pradesh of M/s Bharat Petroleum Corporation Limited (BPCL) including supply of all materials (as defined in scope of supply), tools & tackles, labour, etc., as per the Schedule of rates, Specifications, Standards, drawings and codes (latest revision), good engineering practices and directions of Engineer-in- charge etc. complete, and as per approved for construction drawings made available to the successful bidder.

The Contractor shall be responsible to complete the entire work in all respect and any other work necessary to complete the job though specifically not covered in the scope of work.

Contractor shall visit the site to ascertain actual site condition to assess the job himself before quoting the rates. No extra claim at a later date shall be entertained due to non-familiarization of site.

2.0 BROAD SCOPE OF WORK

PART-A: Composite Works U&O (West Side)

PART-B: Composite Works U&O (East Side)

The detailed scope of work shall be in general but not limited to the following:

i) Supply of all materials & construction of RCC pavements.

ii) Supply of all materials & construction of RCC drains with gratings/perforated precast covers.

iii) Supply & installation of CI Sluice Gates with frames as per IS: 13349.

iv) Supply & installation of Combined Safety Shower & Eye Wash Units.

v) Supply Fabrication & Laying / Erection of U/G & A/G GI pipes for Fire water spray lines, instrument air.

vi) Fabrication, laying and jointing of Under-Ground 3-layer Polyethylene (3LPE) coated CS piping as per PMS for Fire Water System (Pressure).

vii) Supply & installation of Fire Hydrant, Monitors, Landing Valves, Long Range Monitors, Remote Operated Long-Range Monitors, First Aid Hose Reel (Wall Mounted & Floor Mounted), Hose Box Cabinet (Type – II) & Air Release Valve etc.

viii) Supply & installation of Deluge Valve skids

ix) Supply & installation of spray nozzle, Quartzoid bulb

x) Supply & installation of Portable & Trolly mounted Fire Extinguishers.

xi) Supply of all materials and construction of Hydrant & Monitor platforms on grade.

xii) laying of Double walled corrugated (DWC) HDPE pipes as per IS 16098 Part 2 under roads/ drain crossings.

xiii) Design, engineering, procurement of all equipment for Foam storage system.

xiv) Clearing and removal of debris/ scraps.

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As per drawings, detailed scope of work and schedule of rates mentioned elsewhere in the bid document. All materials, equipment's, tools and tackles, consumables, manpower and supervision required for satisfactory completion of the job shall be supplied by the contractor.

3.0 DETAILED COMPOSITE WORKS ACTIVITIES

The Detailed works shall be as per the its relevant Broad scope of work descried In Clause - 2 above and shall include the following but not limited to the same.

3.1 Earthwork in excavation for all civil works such as RCC pavement, RCC drains etc. including backfilling and disposal of surplus earth as directed by Engineer in charge.

3.2 Earthwork in excavation for all U/G piping works such as Oily waste Sewer (OWS) Contaminated rain water sewer (CRWS), Storm sewer (SS), all closed blowdown services, Fire water (FW) etc. including backfilling and disposal of surplus earth as directed by Engineer in charge.

3.3 Construction of RCC Pavements including supplying & laying of DLC (Dry Lean Concrete) 150micron thick HM HDPE (GRADE-I) film conforming to IS:10889 shall be provided as separation layer between DLC and RCC.

3.4 Providing and laying of Construction joints, expansion joints, sealing joints etc. in the RCC pavements as per drawing / specifications.

3.5 RCC work for encasing of U/G pipe as per drawings/standards.

3.6 Supply & installation and fixing in position CI sluice Gates with frames as per IS:13349 and as per specifications and drawings including transportation to site of work, supplying and fixing bolts, nuts, washers, gaskets etc. complete as per drawings, specifications and directions of Engineer-in-Charge.

3.7 Supply and installation of Combined Safety Shower & Eyewash Units as per spec. no. 6-66-0038, including providing and fixing of necessary foundation bolts in foundations/ pavement.

3.8 Fabrication and laying and jointing of Under-Ground 3-layer Polyethylene (3LPE) coated piping works for underground pipes Oily Waste Sewers (OWS), Contaminated rain water sewer (CRWS), Storm Sewer (SS) systems (Gravity) and Vent Pipe for manholes as per the PMS, including installation of valves, flanges, fittings, etc., to proper grade and alignment, transporting the pipes, fittings, flanges, valves etc. from Owner's storage point to the work site, including, fixing the pipe in walls of manholes, valve pits, all complete.

3.9 Fabrication and laying and jointing of Under-Ground 3-layer Polyethylene (3LPE) as per the PMS for Fire Water System (Pressure), including installation of valves, flanges, fittings, etc., to proper grade and alignment, transporting the pipes, fittings, flanges, valves etc. from Owner's storage point to the work site, fixing the pipe in walls of manholes, valve pits, all complete.

3.10 Supply, fabrication, laying and joining of Carbon steel galvanized pipes, valves & specials for U/G Fire water spray lines (pressure pipe) as per the PMS/VMS including supply & installation of valves, flanges, fittings, etc., to proper grade and alignment, transporting the pipes, fittings, flanges, valves, pipe specials, etc. from contractor's storage point to the work site, etc. complete.

3.11 Supply and installation of Firefighting equipment such as Fire Hydrant, Monitors, Landing Valves, Long Range Monitors, Remote Operated Long-Range Monitors, First Aid Hose Reel (Wall Mounted & Floor Mounted), Hose Box Cabinet (Type – II) & Air Release Valve etc. at

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grade & at elevations including transportation to worksite from storage point, testing, flushing etc. all complete.

3.12 Supply and installation of Portable & Trolly mounted Firefighting equipment such as 6kg / 9kg / 50kg DCP Fire extinguishers, 4.5kg CO_2 Fire extinguishers, etc. including transportation to worksite from storage point, testing, flushing etc. all complete.

3.13 Supply and installation, erection, testing and commissioning of Deluge valve skid, with UL/FM listed/approved Deluge Valve (consisting of deluge valve, strainers, solenoid valve, air pressure regulator, limit switches, pressure gauge, pressure transmitters, inlet/ outlet valves, drain valve, priming valve, vent valve including alarm motor gong, fittings, local control panel including bypass connection to deluge valve along with strainer and ball valve etc. complete) actuated through air (pneumatic) detection system including installation/placing the skid at the designated location and fixing with anchor bolts, connecting the water inlet and system piping, connecting detection network piping, fittings etc. complete.

3.14 Supply and installation of spray nozzle in fire water spray system for columns, vessels.

3.15 Supply and installation of quartzoid bulb detectors in fire water spray system for columns, vessels, pumps.

3.16 Earthwork in excavation for civil works for construction of Hydrants & Monitor's platforms including backfilling and disposal of surplus earth as directed by Engineer in charge.

3.17 Providing and laying Brick Masonry in cement mortar 1:4 (1 cement: 4 Coarse sand) in one or more brick thickness and in any shape for Hydrant/Monitor's platforms, etc. including providing recesses, openings, etc. including curing, finishing the joints flush below ground level.

3.18 Providing 13mm thick average cement plaster in cement mortar 1:3 (1 cement : 3 sand) on brick walls for hydrant platforms.

3.19 Providing and laying 100 mm thick cement concrete lining of M-20 grade with 20mm and down size graded stone aggregates for Hydrant & Monitor.

3.20 Complete work for laying of Double walled corrugated (DWC) HDPE pipes as per IS 16098 Part 2 under roads/ drain crossings for maximum depth of 2m measured from top of DWC pipe upto road top level in all types of soil excluding soft rock and hard rock using HDD (Horizontal Directional Drilling) method using machine including supply of all materials, machinery, manpower etc.

3.21 Design, engineering, manufacture, procurement of equipment, materials and bought out components including all civil, structural, electrical, mechanical, instrumentation & piping material, assembly at shop, inspection, testing at manufacturer's works, packing, transportation, delivery including supply of all mandatory spares, commissioning spares, special tools & tackles, first fill of consumables, erection material, foam tank, supporting structure, underground tank, pump etc. complete as per drawings, specifications and directions of Engineer-in-Charge.

It shall be clearly understood that all the works mentioned above together with all the incidental works whether specifically mentioned or not shall be deemed to have been included in the scope of work.

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4.0 SCOPE OF SUPPLY

4.1 OWNER'S SCOPE OF SUPPLY

All CS pipes including fittings, valves etc. (Bare and 3L PE coated).

4.2 CONTRACTOR'S SCOPE OF SUPPLY

a. All materials (consumables/ non-consumables) including tools, tackles, plant machinery, workers/labors, etc. required for completion of the works as per Schedule of Rates shall be in contractor's scope of supply and shall be the responsibility of Contractor within the quoted rates.

b. All material shall be of approved brand/ make as per the list of approved brand/ vendors for Civil Structural & Piping, valves, fittings etc. items attached elsewhere in the contract. However, in case of any deviation from the list of approved brand/ vendors, prior approval from Owner/ Engineer In-charge shall be obtained prior to use of the material at site. All the material required to complete the entire work as per scope of work, schedule of rates, specifications, standards and drawings.

c. Galvanized pipe of PMS J95A & J2A including fittings and valves.

d. All firefighting equipment including Deluge Valve, Hydrant, Landing Valves, Monitor, Long Range Monitor, Remote Operated Long-Range Monitor, First Aid Hose Reel, Hose Cabinet, Air Release valve etc.

e. Portable & Trolly mounted Fire Extinguishers.

f. Safety Shower & Eye Wash Assembly.

5.0 SPECIFIC REQUIREMENTS TO BE FULFILLED BY THE CONTRACTOR

Note: In case of any contradiction between these Specific Requirements and Requirements/ Specification specified elsewhere in the tender document, the Specific Requirements given below shall have precedence.

a. Contractor shall arrange all the approvals required.
b. All works shall be done to the entire satisfaction of the Engineer-in-Charge. Any work not carried out in accordance with the instructions shall be dismantled and made good without any extra cost and time implication to the owner.

6.0 PREAMBLE TO SCHEDULE OF RATES

a. Wherever "plant boundary" or "complex limit" is mentioned in the SOR or specifications, the same shall be read as "Refinery property limit of Bina Refinery Complex & Bina Despatch Terminal".
b. Environment for selection of painting system shall be considered as Industrial.

7.0 APPROVALS

Obtaining statutory approval from local authorities such as Municipal Corporation, Development Authorities, Inspector of Factories and any other concerned authorities required for their own working before starting the works at site.

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8.0 LIST OF ATTACHMENTS

8.1 STANDARD SPECIFICATIONS

Sl. No.	Title of Document	Specification No.	Rev
1	Standard Specification for earthwork for U/G piping	6-65-0006	4
2	Standard specification for concrete pavement	6-65-0019	4
3	Standard Specification for underground & above ground G.I. pipeline system (water services)	6-65-0027	6
4	Standard specification for fabrication and laying of underground piping	6-65-0030	6
5	Standard specification for rubber expansion joint	6-65-0083	5
6	Standard specification for portable fire extinguisher	6-66-0004	1
7	Standard specification for non-percolating lay flat delivery hose for fire fighting	6-66-0011	5
8	Standard specification for standard post type fire hydrant (with or without pumper connection)	6-66-0012	5
9	Standard specification for first aid hose reel	6-66-0018	5
10	Standard specification for stand post type water monitor	6-66-0021	4
11	Standard specification for water cum foam monitor single barrel type (fixed & variable flow)	6-66-0027	5
12	Standard specification for safety shower and eye wash	6-66-0038	5
13	Standard specification for water spray nozzle for cooling	6-66-0046	4
14	Standard specification for hose cabinet	6-66-0047	4
15	Standard specification for deluge valve skid	6-66-0048	4
16	Standard specification for 50 kg and 75 kg capacity dry chemical powder extinguisher	6-66-0061	4
17	Standard specification for fabrication and erection of piping	6-44-0012	6
18	Standard specification for inspection, flushing and testing of piping systems	6-44-0013	6

8.2 STANDARDS

Sl. No.	Standard	Document No.	Rev.
1	Abbreviations, legends and equipment symbols	7-65-0001	5
2	Unit drainage details (rectangular ditch details)	7-65-0272	6

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3	RCC pavement details	7-65-0404	5
4	Installation details of fire water hydrant	7-65-0420	5
5	Installation details of water or water cum foam monitor, long range foam / water monitor	7-65-0421	4

8.3 LIST OF INSPECTION TEST PLANS

Sl. No.	Standard	Document No.	Rev.
1	Inspection and test plan (ITP) for civil, structural and architectural works (item rate contracts-with categorization)	6-82-3100	2
2	Inspection and test plan (ITP) for mechanical works (item rate contracts-with categorization)	6-82-3200	2

8.4 JOB SPECIFICATION

Sl. No.	Specification	Document No.	Rev.
1	Job Specification for Surface Preparation & Protective Coating	B957-000-06-42-PLS-01	0
2	Job Specification for Surface Preparation & Protective Coating for 3LPE	B957-000-06-42-PLS-04	0
3	Composite Works U & O Part-A (West side)	B957-999-81-45-PK-SOR-9501-A	0
4	Composite works U & O Part-B (East Side+ BDT)	B957-999-81-45-PK-SOR-9501-B	0

8.5 DATA SHEETS

Sl. No.	Specification	Document No.
1	Data sheet of Stand post type fire hydrant (Stand Post Type)	B957-999-81-45-DS-8003
2	Data sheet of Hose cabinet	B957-999-81-45-DS-8004
3	Data sheet of Water cum foam Monitor	B957-999-81-45-DS-8005
4	Data sheet of Spray Nozzles (Medium Velocity)	B957-999-81-45-DS-8007
5	Data sheet of Quartzoid Bulb Detectors	B957-999-81-45-DS-8010
6	Data sheet of Deluge Valve	B957-999-81-45-DS-8011
7	Data sheet of Data Sheet for Air Release Valve	B957-999-81-45-DS-8017
8	Data sheet of Landing Valve (Stand Post Type)	B957-999-81-45-DS-8018
9	Data sheet of First Aid Hose Reel	B957-999-81-45-DS-8019

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10	Data sheet of Long-Range Water Cum Foam Monitor	B957-999-81-45-DS-8020
11	Data sheet of Long-Range Water Cum Foam Monitor (Manual with JRCP Foam Induction)	B957-999-81-45-DS-8021
12	Data sheet for First Aid Hose Reel (horizontal, stand mounting)	B957-999-81-45-DS-8026

8.6 AMENDMENT TO STANDARD SPECIFICATION

S. No	Standard No.	Title
1.	B957-300-81-45-AD-3001	Addendum to Standard Specification No. 6-65-0006, 6-65-0019, 6-66-0004 & 6-66-0061

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SCOPE OF WORK & SUPPLY (STRUCTURAL)

TENDER FOR COMPOSITE WORKS U&O

(TENDER NO – B957-999-69-41-PK-T-9501)

PROJECT : **BINA PETROCHEMICAL AND REFINERY EXPANSION POJECT (BPREP)**

CLIENT : **M/S BHARAT PETROLEUM CORPORATION LIMITED**

CONSULTANT : **M/S ENGINEERS INDIA LIMITED (EIL)**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	17/03/2026	ISSUED FOR TENDER	JH	DK	SP

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1.0 SCOPE OF WORK

The scope of work in general shall include Construction of all Civil-Structural Works for **Composite Works Tender for Offsites for Bina Petrochemical & Refinery Expansion Project (BPREP) at Bina, Madhya Pradesh of M/s Bharat Petroleum Corporation Limited (BPCL)** as per the Scope of Work, Scope of Material Supply, Schedule of Rates, Specifications, Standards and Drawings included in the Tender document, etc. all complete.

This Composite works tender consists of Schedule of Rates in two parts, namely

1) Part A – West side
2) Part B – East side + BDT

The contractor shall be responsible to complete the entire work in all respect, including any other work necessary to complete the job, though specifically not covered in the scope of work.

Major structures shall include following but not be limited to the same:

- Platforms, jumpovers & pipe supports in unit and offsite.
- Structural steel works for platforms on/around equipment.
- Retrofitting & modification works in existing steel structures.
- Addition/modification of structures over/on existing structures.
- Erection of already fabricated steel structures, handrail, gratings, ladders, etc.
- Brick masonry works.
- Painting of Structural steel.
- Fire proofing of steel structures & equipment.
- Dismantling of PCC, RCC, brick work, stone masonry Structural steel works, sheeting etc.
- Foundation treatment & ground improvement works below foundation.
- Electrical & Instrumentation supports envisaged on grade/rack/bridge/trestle/ existing structures.
- Any kind of structural steel works including grating, handrail, ladder, staircase etc. not covered above.
- Barricading works

Contractor shall visit the site to ascertain actual site conditions to quantify/ assess the job himself before quoting rates. No extra claim at a later date shall be entertained due to non-familiarization of site.

Major civil and structural activities involved shall include but not be limited to the following:

1. Obtaining all approvals from owner, statutory authorities such as Factory Inspector, Local Municipal or Development Authorities (including existing refinery) and other designated authorities etc. for necessary construction works.

2. Earthwork in excavation in all types of soil, soft rock (by chiseling, controlled blasting etc.), hard rock (by chiseling, controlled blasting, etc.) including dewatering by deploying

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adequate capacity of pumps or dewatering techniques, if required, below ground level for all types of soils, and providing shoring & strutting, wherever required, by open and/ or closed timbering method.

3. Storing/ stacking excavated earth at safe location near foundation or at designated place for reuse within the plant boundary as instructed by owner/ Engineer-in-Charge. Segregating unserviceable earth separately and disposing the same at designated place as instructed by owner/ Engineer-in-Charge.

4. Backfilling at all depths with selected and approved earth available and from borrow areas, and transportation & disposal of surplus earth (including rock material) and debris to the areas designated by Engineer-in-charge.

5. Backfilling at all depths with selected and approved crushed rock available within the plant boundary.

6. PCC works including lean concrete at all depths below foundations of all types, plinth beams, walls, non-suspended slabs, trenches, etc., and in screed at all depths below plinth level.

7. PCC Works including lean concrete in screed at all depths below plinth level & at all heights above plinth level.

8. RCC works in sub-structure for foundation of all types including open foundation etc., plinth beams, walls, basement, non-suspended floor slabs, trenches, pits etc. at all depths.

9. RCC works in super-structure for columns, beams, walls, floor & roof slabs, etc. at all heights.

10. RCC works for pre-cast elements, trenches (including covers) etc. and any other miscellaneous works required as per AFC drawings and transportation of precast elements to site for erection.

11. Supply, cutting, bending, fixing of reinforcement for RCC works in sub-structure at all depths and in super-structure at all heights.

12. Preparation of Bar Bending Schedule for concrete structures as per the ‘Approved for Construction’ (AFC) drawings.

13. Centering & Shuttering (including curved shuttering) in sub-structure at all depths and in super-structure at all heights/ elevations.

14. Concrete encasing works.

15. Providing isolation joints around column/pedestal/trenches etc.

16. Masonry works in substructure and superstructure for all depths and heights as per specifications.

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17. Providing & laying sand-filling at all locations; as specified or directed by Engineer-In-Charge.

18. Supplying and fixing mechanical rebar coupler.

19. Structural steel works with rolled steel, parallel flange sections, built-up sections and tubular/hollow sections, including supply, fabrication, transporting, storing, assembling & erecting in position & testing/examining bolted &/or welded Structural Steel & preparation of detailed fabrication drawings for all types of structures at all locations and heights in super-structure.

20. Barricading works.

21. Painting for Structural steel shall be as per painting Job Specification no. B957-000-06-42-PLS-01.

22. Dismantling/ Demolishing of PCC/ RCC, masonry, Structural steel works/sheeting for all depths below plinth level and all heights above plinth level including disposal of unserviceable item anywhere within the plant boundary. Stacking & depositing serviceable items in Owner's yard, location as approved by Engineer-in-Charge.

23. Dismantling, modification & re-erection of Structural steel members, electroforged galvanized gratings & handrailing for all types of Structures; at all locations & all heights.

24. Dismantling & re-erecting of Steel structures; wherever required.

25. Retrofitting/Jacketing works on existing Steel/RCC structures, as per drawings and directions of Engineer-in-charge.

26. Addition/modification of structures over/on existing structures, as per drawings and directions of Engineer-in-charge.

27. Erection of already fabricated steel structures/ members, handrails, ladders, gratings, etc. (fabricated by others) for new structures, over/on existing structures, over/on equipments, at all locations & all heights.

28. Fabrication & placing/ erection of miscellaneous steel items like Anchor Bolts, metal insert plates, Pipe sleeves, rungs, prefabricated hand railing etc. as per EIL standards/specs. as directed by Engineer-in-charge at any location wherever required.

29. Mixing of approved brand of BI-POLAR concrete penetrating corrosion inhibiting admixture in concrete as per manufacturer's specification & EIL Specifications for protection of reinforcement against corrosion.

30. Fixing of BITUMEN IMPREGNATED FIBRE BOARD conforming to IS: 1838 of approved quality in expansion joints at all locations and levels in concrete structures.

31. Sealing of EXPANSION JOINTS at all locations and levels in Concrete Structures with POLYSULPHIDE SEALING COMPOUND as per IS: 12118 including raking of joints etc.

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32. Providing and fixing electro-forged hot dipped galvanized MS gratings as per EIL Standards.

33. Providing fixing MS chequered plates & at all heights on structures.

34. Providing anchor fasteners to fix structures/ pipe supports etc

35. Fire proofing of equipment supports, structures etc. as per approved Engineering design basis, specifications & AFC drawings.

36. Providing one side machined sliding plates, embedded in the grout, under horizontal equipment.

37. Fixing of re-bars in already cast concrete.

38. Concrete retrofitting works using epoxy resin.

39. Providing & laying of geogrid, boulder soling and sand gravel mix as per specification/drawing.

40. Preparation of detailed fabrication drawings using TEKLA or Autodesk Advance Steel or equivalent 3D Modeling software, including submission of design calculation for connections, showing the master index of particular structures indicating nomenclature to facilitate sequence of erection activity, for all types of structures. Connections in fabrication drawing shall be prepared only after review of connection details by the owner. Final model shall be submitted for records which shall include all fabrication drawings, related files, catalogues along with all erection/ part marks and material reports.

41. Providing temporary supporting/protection arrangement to protect the existing facilities like pipes, cables, equipments and other miscellaneous structures which may be affected during the course of work at all depths & heights.

42. Isolation of existing structures (concrete/steel) if necessary by providing necessary permanent supports for existing structures during the course of work at all depth & heights.

43. Providing safety structures & safety personnel as per specification.

44. Preparation of AS-BUILT mark-up prints on AFC drawings and subsequent updation of the same in soft copy (Auto Cad) of AFC drawing and submission of hard copy (as specified elsewhere in the bid package) and soft copy to Engineer-in-charge.

45. Removal of scrap, generated during construction, includes segregation of scrap into serviceable and unserviceable material and transportation of serviceable material to Owner's storage.

46. Clearing and removal of debris includes clearing the site of all unserviceable material from the site after completion of work and disposal of the same at a designated area as directed by Engineer- in- charge.

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47. It shall be clearly understood that all the above works together with all incidental works to complete the work whether specifically mentioned or not shall be deemed to have been included in the scope of work.

48. This scope of work is to be read in conjunction with the other scope of works enclosed in the tender document.

Any other Civil Structural Works, not specifically mentioned herein, but required for the satisfactory and successful completion of the project as per directions of the Engineer-in-Charge shall also be in the scope of the contractor.

2.0 SCOPE OF SUPPLY OF MATERIALS

2.1. OWNER'S SCOPE

NIL

2.2. CONTRACTOR'S SCOPE

Procurement and supply of all material (consumables/ non-consumables) required for the execution of Civil Structural works under this contract shall be in the scope of the Contractor.

All material shall be of approved brand/ make as per the list of approved brand/ vendors for Civil Structural and Architectural items attached elsewhere in the contract. However, in case of any deviation from the list of approved brand/ vendors, approval from Owner/ Engineer-In-charge shall be obtained prior to use of the material at site.

3.0 SPECIFIC REQUIREMENTS TO BE FULFILLED BY THE CONTRACTOR

Note: In case of any contradiction between these Specific Requirements and Requirements/ Specification specified elsewhere in the tender document, the Specific Requirements given below shall have precedence.

3.1 Mandatory use of mechanical excavators for excavation, however manual excavation for minor foundations & new foundations to be constructed close to existing foundations & around existing Underground facilities, can be taken up after due approval of Engineer-in-Charge.

3.2 Mandatory installation of weigh batching plant of adequate capacity for concrete/ usage of ready mix concrete (RMC) along with transit mixers and concrete pumps as per the direction of Engineer-in-Charge.

3.3 Batching plant shall be located outside plant boundary. Land for same shall be arranged by contractor.

3.4 Disposal of unserviceable material etc. shall be done outside plant boundaries. Land required for the disposal shall be arranged by the Contractor. Contractor shall obtain relevant statutory approval from all statutory authorities (like municipal etc.) and including payment of charges/ royalty/ octroi for the same. Contractor shall keep

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the client indemnified of any liability and/ or complaint from local authorities/ municipal bodies. However, serviceable surplus earth and rock materials shall be disposed within plant boundary limit at designated location as per direction of Engineer-in-charge.

3.5 In case of borrow earth is required from outside refinery; location for the same shall be identified by the contractor. Contractor shall obtain relevant statutory approval from all statutory authorities (like municipal etc.) and including payment of charges/ royalty/ octroi for the same. Contractor shall keep client indemnified of any liability and/ or complaint from local authorities/ municipal bodies.

3.6 For cutting & bending of re bars mechanized equipment/ cutting- bending machine shall be used.

3.7 Dismantling shall be done by mechanical means; as approved by Engineer-In-Charge.

3.8 Controlled specialized demolition of part of a structure (RCC/ Structural Steel) shall be done with absolutely no disturbance of remaining part, as the same may be in operation.

3.9 Controlled specialized demolition shall be done to retain only selective part of a structure as decided by Site Engineer-In-charge, and to provide supports for existing facilities to be retained.

3.10 Structural concrete mix shall be approved Design Mix.

3.11 Generally the use of one of the following cements shall be considered,

- 43/53 Grade Ordinary Portland Cement (OPC) conforming to IS 269.
- Portland Pozzolana Cement (PPC, fly ash based) confirming to IS 1489 Part 1.
- Portland Pozzolana Cement (PPC, calcined based) confirming to IS 1489 Part 2.
- Portland Slag cement (PSC) conforming to IS 455.
- *Sulphate Resistant Portland Cement(SRC) conforming to IS 12330.

* For specific requirement as specified in respective drawings.

3.12 Reinforcing steel shall be high strength deformed steel bars of grade Fe500D(TMT) conforming to IS 1786.

3.13 All lugs shall be of high strength deformed bars of minimum grade Fe500D conforming to IS 1786

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3.14 Anchor bolts shall be of grade E250 quality BR/B0 confirming to IS 2062. All primer/ epoxy except finish paint shall be applied to all insert/sleeve prior to fixing in position before pouring of concrete.

3.15 Metal insert plates shall be of grade E250 quality BR/B0 confirming to IS 2062.All inserts/ sleeves shall be properly secured in position before pouring of concrete.

3.16 Supply of connection bolts is in the Contractor's scope. For all bolted connections high strength hot dip galvanized bolts of property class 8.8 as per IS 3757 & IS 4000 shall be used. Hot dip galvanized Nuts and washers shall conform to IS 6623 & IS:6649 respectively.

3.17 Before commencing the structural steel works in offsite area, contractor to ensure all the Grid dimensions, U/s base plate level, shall match with the foundation layout & TOG of the pedestal as per the actual AS-BUILT drawings/site condition.

3.18 Mandatory use of Electro-forged hot-dipped Galvanized MS grating.

3.19 Structural steel shall be of grade E350 Quality BR/B0 confirming to IS 2062. Minimum grade of steel for insert plate, grating & steel structures in platforms taken from equipment; shall be of Grade E250 Quality BR/B0 conforming to IS 2062. For Steel Structures, field welding shall be minimized by employing modular construction to the extent possible.

3.20 Fabrication of Anchor bolts to be taken on priority to ensure placement of the same at the time of concreting.

3.21 The contractor shall ensure the required founding strata confirming to soil recommendation for all foundations and bring it to the notice of Engineer-in-charge, if the founding depth encountered is different from that specified in the drawings.

3.22 Dewatering including supply of adequate no. of pumps wherever required shall be carried out by the contractor at his cost to keep the Ground water table down below the founding level.

3.23 The construction of underground piping & drainage system, if provided at a depth lower than that of the foundations, shall be taken up before construction of foundation. However in general underground piping activity shall be executed before backfilling of soil.

3.24 Fabrication of structure steel shall be done in contractor’s fabrication shop outside plant boundary; area to be arranged by contractor. All shop connections shall be welded & field/ site connections shall be bolted unless otherwise mentioned.

3.25 Contractor shall make his own arrangements for casting the precast elements, outside the plant premises. Land required for the same shall be arranged by the contractor.

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3.26 Contractor has to take of all safety measures as per Refinery fire and safety standard.

3.27 Contractor shall consider recycling of construction & demolition waste to the extent possible. Usage of recycled aggregate, recycled coarse aggregate, M-sand & usage of products having less embodied carbon (i.e. low carbon foot-print); shall be adopted for sustainable construction, with approval of Owner/Engineer-In-Charge.

3.28 Whenever new Construction or demolishing/ dismantling is considered close to the existing structure, manual excavation shall be carried out as per direction of Engineer-in-Charge. Trail pit, if required, shall be carried out before excavation to check the existence of underground facilities.

3.29 Proper scaffolding shall be provided around the working area for sufficient height with cladding adopted for barricading in premises to isolate construction area. The quoted rate shall be inclusive of barricading, no extra claim shall be made at later date.

3.30 During the execution of the work, the contractor, at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise approved means which shall be supplied and installed by the Contractor as required till such time the installation work is satisfactorily completed. The provided guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by him or other agencies.

3.31 The contractor shall ensure proper co-ordination / co-operation with other agencies, while working in the Construction area, without affecting others work front areas.

3.32 Various tolerances required as marked on the drawings conforming to codal requirements/ specifications or as directed by the Engineer-in-Charge shall be maintained by the Contractor. Verticality shall be maintained at every stage and the same shall be verified with Theodolite/ Total Station.

3.33 During execution of work, all existing facilities (Temporary /Permanent) shall be protected from any damage. In case of any damage / dismantling (if required) is required to be carried out for carrying out contractor's work, the same shall be restored to original condition to the satisfaction of Owner/ Engineer-In-charge without additional time and cost implication.

3.34 All works shall be done to the entire satisfaction of the Engineer-in-Charge. Any work not carried out in accordance with the instructions shall be dismantled and made good without any extra cost and time implication to the owner.

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4.0 LIST OF ATTACHMENTS

4.1. SPECIFICATIONS

S. NO.	SPECIFICATION NUMBER	REVISION	TITLE OF DOCUMENT
1	6-68-0001	6	Standard specification civil and structural works -General scope
2	6-68-0002	7	Standard specification civil and structural works -Materials.
3	6-68-0003	6	Standard specification civil and structural works -Earthwork.
4	6-68-0004	8	Standard specification civil and structural works -Plain & Reinforced Cement Concrete
5	6-68-0006	8	Standard specification civil and structural works -Structural steel works
6	6-68-0007	8	Standard specification civil and structural works structural steel works (tubular / hollow sections)
7	6-68-0008	8	Standard specification civil and structural works -Miscellaneous Steel Works
8	6-68-0009	5	Standard specification civil and structural works -Brick Masonry
9	6-68-0012	6	Standard specification civil and structural works -Demolition & Dismantling
10	6-68-0013	6	Standard specification civil and structural works -Miscellaneous Items
11	6-68-0014	2	Standard specification civil & structural works precast concrete
12	6-68-0017	2	Standard specification - civil & structural works - bipolar concrete penetrating corrosion inhibiting admixture
13	6-68-0056	5	Standard specification - civil & structural works – bonding fresh concrete to old concrete by epoxy resin bonding system
14	6-68-0063	2	Standard specification - civil and structural works - design of scaffolding (for RCC beam and slab)
15	6-82-3100	2	Inspection & test plan (ITP) for civil, structural & architectural works (item rate contracts – with categorization)
16	6-82-6100	4	Standard Quality Assurance Plan (Item Rate contracts)
17	6-82-0001	2	Standard specification for health, safety & environment (HSE) management at construction sites

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S. NO.	SPECIFICATION NUMBER	REVISION	TITLE OF DOCUMENT
18	6-78-0001	3	Specification for quality management system requirements from bidders
19	6-78-0002	3	Specification for documentation requirements from Contractor

4.2. JOB SPECIFICATIONS

	Document NO.	Rev	Title of Document
1	B957-000-06-42-PLS-01	2	Job Specification for Surface preparation and protective coating

4.3. STANDARDS

S. NO.	STANDARD NUMBER	REVISION	DESCRIPTION OF STANDARD
1	7-67-0008	8	Pedestal for stair/Ladders
2	7-67-0010	7	Foundation for sliding supports for pipes on grade
3	7-67-0012	5	Short sliding pipe supports on existing RCC pavement
4	7-68-0051	7	Standard lifting hooks in precast slabs & chequered plates.
5	7-68-0052	8	Details for M.S. Rungs for conc. Structures
6	7-68-0056	8	Metal Insert Plates
7	7-68-0060	1	Handrails – Tube & Ball Type
8	7-68-0062	7	Typical cranking detail of rebar at beam and col. Junctions
9	7-68-0101	7	Standard re-bar shapes & cut length computation
10	7-68-0102	6	Adjustment of stirrups beam crossing
11	7-68-0103	7	Reinforcement details at circular cut-out in slab.
12	7-68-0104	7	Reinforcement details at Sq. /Rect. Cut-out in slab.
13	7-68-0106	7	Standard lap length for rebars
14	7-68-0201	7	Standard lugs.
15	7-68-0202	8	Typical grating support.
16	7-68-0203	8	Typical chequered plate supports.

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S. NO.	STANDARD NUMBER	REVISION	DESCRIPTION OF STANDARD
17	7-68-0206	1	Detail of welded column splice (unequal parallel flange section).
18	7-68-0207	6	Welded column splice (unequal joist section).
19	7-68-0208	7	Splicing detail for rolled section.
20	7-68-0211	6	Beam to beam and beam to column connection details.
21	7-68-0213	7	Base plate for channels
22	7-68-0214	7	Base plate for angles
23	7-68-0215	8	Base plate for joists
24	7-68-0224	0	Bolted bracing connection details of angles, channels and square hollow sections
25	7-68-0251	7	Welding symbols
26	7-68-0355	4	Instrumentation cable duct / tray supporting arrangement
27	7-68-0417	9	M.S. Anchor Bolt Assemblies
28	7-68-0501	8	Handrails
29	7-68-0503	1	Arrangements for access from grade to spiral staircase of steel tanks
30	7-68-0506	8	Steel stairs.
31	7-68-0507	9	Details of steel ladder.
32	7-68-0509	8	Steel ladder joint details
33	7-68-0562	6	Small operating platforms on grade / RCC elevated structure
34	7-68-0563	5	Pipe sleeper crossover
35	7-68-0626	6	Cable trench.
36	7-68-0627	2	Precast cable trench and joint detail
37	7-68-0653	4	Typical detail of weld length for angle members
38	7-68-0654	4	Detail of moment connection for MC [ ] column to [ ] beam.
39	7-68-0655	6	Cable trench for class-AA tracked / 70R-wheeled vehicle (crane approach)
40	7-68-0658	1	Bolted shear connection details for beam

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S. NO.	STANDARD NUMBER	REVISION	DESCRIPTION OF STANDARD
			to beam
41	7-68-0659	0	Bolted shear connection details for beam with column
42	7-68-0660	3	Typ. detail of moment connection with MB col. / MC box col. to MB beam
43	7-68-0683	5	Monorail fixing details with steel members
44	7-68-0684	5	Monorail fixing details with R.C.C. Beam
45	7-68-0686	1	Welded shear connection details for parallel flange beam with parallel flange beam
46	7-68-0687	1	Details of moment connection for parallel flange beams with parallel flange columns
47	7-68-0688	1	Welded shear connection details for parallel flange beam with parallel flange column
48	7-68-0689	4	Shear connections welded type - beam to beam
49	7-68-0690	0	Bolted moment connection detail
50	7-68-0691	4	Detail of Sliding T-Support
51	7-68-0692	2	Detail of sliding t-support using hollow sections
52	7-68-0695	4	Electrical cable tray supporting structure
53	7-68-0696	3	Detail of lacing connections
54	7-68-0697	6	Electro forged grating type-I & type-II
55	7-68-0699	2	Saddle supports for equipments on tech. structures
56	7-68-0250	1	Equivalent structural steel sections for substitution

4.4. DRAWINGS

NIL

4.5. OTHER DOCUMENTS

Sl. No	Standard No.	Rev	Title of Document
1	B957-999-81-41-LL-9501	0	List of approved manufacturers for products related to Civil-Structural works.

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5.0 ADDENDUM TO STRUCTURAL SPECIFICATIONS & SOR

Sl. No	Specification/ SOR item No.	Clause No.	MODIFICATION
1.	6-68-0003 Rev.6	2.2	Clause "*This is fissured/ disintegrated rocky strata, boulders (volume more than 0.028 m3and less than 0.400 m3) and also which cannot be quarried/ excavated by using above manual tools but can be quarried/ excavated manually by using crow bars is classified as soft rock. Soft rock shall include all kinds of stiff and stratified rock, such as shales, thinly bedded phillites, laterite hard conglomerate, lime stone, sand stone and unreinforced cement concrete below ground level. Soft rock may be quarried or split with crow bar or picks and can also be excavated by rippers, dozers and other mechanical equipment, but without the aid of blasting. If required and permitted, light blasting may be restored to, for loosening the materials, but this will not, in any way entitle the material to be classified as "Hard Rock"*." is withdrawn and shall be read as *"This is fissured/ disintegrated rocky strata, boulders (volume more than 0.028 m3and less than 0.400 m3) and also which cannot be quarried/ excavated by using above manual tools but can be quarried/ excavated manually by using crow bars is classified as soft rock. Soft rock shall include all kinds of stiff and stratified rock, such as shales, thinly bedded phillites, laterite hard conglomerate, lime stone, sand stone and unreinforced cement concrete below ground level. Soft rock may be quarried or split with crow bar or picks and can also be excavated by rippers, dozers and other mechanical equipment. If required & permitted, Control Blasting, Chiseling, Chemical Blasting may be resorted to, for loosening the materials, but this will not, in any way entitle the material to be classified as "Hard Rock"."*
2.	6-68-0002 6-68-0006 6-68-0008	All Relevant	Wherever "EIL Specification No. 6-79-020" is mentioned, the same shall be read as "Job Specification No. B957-000-06-42-PLS-01"

6.0 PREAMBLE TO SCHEDULE OF QUANTITIES

6.1 SOR indicates only estimated quantities. Unit rate quoted against each SOR item shall be applicable for any addition & deletion during execution of the project.

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6.2 Depth of foundation in general shall be 3.0 m below FGL. (This data is for general guidance of the Contractors; however deviation from the noted depth shall not form a basis for any extra claim).

6.3 The maximum approximate height of structures shall be 10.0 m (This data is for general guidance of the Contractors; however, deviation from the noted height shall not form a basis for any extra claim).

6.4 As per Geotechnical data, ground water table is at finished ground level. The expected water table depth may fluctuate. The quoted rate of excavation shall include requirement of dewatering etc. for completion of total works including concreting, backfilling etc. and no extra amount is payable on this account.

6.5 Item description provided in Schedule of Rates (Short Description) is in brief, while quoting and filling the rate in these Schedule of Rates (Short Description), Bidder shall take into consideration complete scope of work/item description as mentioned in Schedule of Rates (Detailed Description) for the relevant item. **The rate quoted in Schedule of Rates (Short Description) shall be deemed to include all activities of work mentioned in item description of Schedule of Rates (Detailed), scope of work, specifications, standards etc. & stringent of all shall govern.**

6.6 For protective coating/ painting system, plant location shall be considered as Inland.

6.7 Wherever “plant boundary” is mentioned in the SOR or specifications, the same shall be read as “Refinery property limit”.

6.8 All items in the Schedule of Rates shall be inclusive of all material, workmen, constructional infrastructures like scaffolding/ staging, finishing, cleaning, cutting chases/ holes etc. in brick work/AAC block work/ RCC work and making good the same and rectification of any damaged work shall be applicable for all heights and locations.

6.9 The minimum cement content and maximum water-cement ratio for RCC & PCC works shall be as below:

Exposure condition	Type of concrete	Grade of Concrete	Minimum cement content (kg/m^3)	Maximum free water-cement ratio
Moderate	Plain concrete	M20	240	0.6
	Reinforced concrete (sub-structure)	M25	330	*0.5
	Reinforced concrete (super-structure)	M25	300	*0.5
	Reinforced concrete (Liquid retaining sub-structure)	M30	350	*0.45
	Reinforced concrete (Liquid retaining	M30	350	*0.45

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	super-structure)			

*For self-compacting concrete, maximum free water-cement ratio shall be 0.4

7.0 Digital Reporting & Tracking for Structural Steel

1. Fabrication model shall be submitted simultaneously with fabrication drawing. Model shall be submitted through online downloadable link with minimum 6-month validity.
2. Excel sheet of status of all individual Assembly shall be E-mailed to Engineer-In-Charge on daily basis. Following two tables shall be part of the daily digital status reporting.
3. Model Identification (Sheet 1 in Excel)

Model Name	List of EIL Design Drawing	List of EIL Standards
Structure-1	Drawing-1 Drawing-2 Drawing-3 …….	Standard-1 Standard-2 …….
Structure-2	…….	…….

4. Assembly wise Status in Separate Sheet for each Model/Structure.
   a. Name of Sheet shall be same as Model Name.
   b. Plates forming integral part of the assembly need not be reported separately. Only Loose plates for field erection shall be reported in following table.
   c. For Multiple count identical assemblies, sub-mark shall be tagged in fabrication shop. Each sub-mark shall be reported in different rows.

Assembly Name / Mark	Sub Mark	Highest / Top Elevation.	Drawing Submitted Date	Fabrication Completed Date	Dispatch Date	Site Received Date	Erection Date
C-01	1	109.100					
C-02	1	121.100					
…….	….	…….					
BEAM-1	1	108.000					
BEAM-2	1	108.000					
…….	….	…….					
BRACE-1	1	107.975					
BRACE-1	2	107.975					
BRACE-2	1	120.975					
BRACE-2	2	120.975					
……..	….	…….					
and so on.							

8.0 SCHEDULE OF RATES

Refer **Document No. B957-999-81-41-PK-SOR-9501-A, & B957-999-81-41-PK-SOR-9501-B**

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SCOPE OF WORK & SUPPLY
SMED
FOR
COMPOSITE U&O WORKS

(TENDER NO. B957-999-69-41-PK-T-9501)

PROJECT	**:**	**MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)**
OWNER	**:**	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
EPCM	**:**	**ENGINEERS INDIA LIMITED**
EIL JOB No.	**:**	**B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	26.02.2025	ISSUED AS TENDER INPUT	RNK/AS	PR	PB

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SECTION A: STATIC EQUIPMENT

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CONTRACTOR'S SCOPE OF WORK/SUPPLY FOR STATIC EQUIPMENTS

The Scope includes the following:

1.0 This scope of work and supply of contractor shall be read in conjunction with Schedule of rates (Doc. Nos. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B) and specifications, standards appearing in the list of applicable documents / attachments furnished below.

2.0 The scope includes the erection, supply and application of painting (touch-up), supply and application of insulation with cladding (Hot, Cold, and Safety), Inspection, Local PWHT (if required), scaffolding, barricading works for Vessels, Heat Exchangers and Iso pentane Bullet etc. as defined in the tender.

3.0 Issuance of FIM's, Transportation from Owner's storage to erection site, alignment, grouting, chemical cleaning of equipment, dressing up of equipment involves activities installation of insulation with cladding, installation of ladder/platforms, handrails, piping spools with supports, demister, internal gratings and other associated internals/accessories, complete in all respects.

4.0 Hydro testing of new exchangers shall be carried out according to Clause 4.1.14 of EIL Specification 6-76-0001. (Refer Item no. 01VV.30.3 of SOR B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B).

5.0 Cleaning of site, shifting and handing over of the removed items to owner at their designated location.

6.0 Chemical Cleaning shall be carried out as per Specifications attached in the tender document. (Refer item no. 01VV.30.14 & 01VV.30.15 of SOR B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B).

7.0 All necessary spading/ despading works, including providing necessary tools, tackles, equipment, labours required for the job, before start of any work inside the equipment and also after completion shall be in Contractor's scope. The same shall be included in the quoted price.

8.0 Provision of adequate local barricading or screening, if any as required by Engineer-in-Charge, shall be in Contractor's scope.

9.0 Provision of any scaffolding (both internal and external), as per instructions of Engineer-in-Charge shall be in Contractor's scope. The Scaffolding is to be made out of tubular structures (standard scaffolding pipes of 40mm dia.) and shall be self-locking type. Working platforms or stages shall be provided as per instructions of Engineer-in-Charge. A clear gap of 50 -70 mm should be maintained between the edge of scaffolding pipes and side wall of shell. In no case the pipe edges should touch shell surface except at bottom support points (for Internal Scaffolding only), where pipes should be supported on flat plates (flat pieces of plates to be welded at the end of the vertical scaffolding pipes) to avoid damages to shell surfaces. Wooden planks, bamboo, coir ropes, nylon ropes, cotton or any such combustible material should not be used for making scaffolding.

10.0 All tools, tackles, equipment including providing labours required for internal cleaning along with supervision shall be provided by contractor as per instruction of Engineer in charge, any residual cleaning, if required for carrying out hot jobs shall be in the scope of contractor.

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11.0 Preservation of static equipment using desiccants and moisture control materials shall be executed as instructed by EIC.

12.0 Static equipment flanges, fasteners and related preservation activities including greasing shall be included, dedicated preservation team with one supervisor to be deployed.

13.0 Preparation of all documents like Procedures, Documents, Detail fabrication Drawings etc., approval from Client / Consultant, as-built drawings after completion of all works shall be in scope of Contractor

14.0 **CHEMICAL CLEANING**:

Preparation of procedure and approval of same from Client / Consultant, procurement of all chemicals, blinding of nozzles, piping connections etc., temporary blinds, temporary spools / jump overs, fabrication including supply of all required materials, installation, all tools & tackles, instruments, equipment, accessories required for carrying out chemical cleaning of equipment, taking samples and noting parameters etc. including manpower, supervision etc. shall be in scope of Contractor. The Chemical Cleaning of the following equipment shall be carried out as per Specifications attached in the tender document.

Chemical Cleaning and passivation shall be performed by the mechanical contractor for the below items as per Schedule of rates B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B). For equipment's which required Chemical Cleaning and passivation, refer the scope marked P&ID of Chemical Cleaning and job specification attached elsewhere in the tender document.

15.0 **PAINTING:**

Supply and application of paint for touch up for all equipment's shall be included in contractor's scope. Painting for the equipment's to be carried-out as per the details furnished in SOR doc. no. SOR B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B).

Note for Touch Up painting works: The Surface preparation, primer application and finish paint is done by Equipment vendor. Only touch up paint wherever required (i.e.: Paint damage due to erection, transportation...etc) shall be done at site by mechanical contractor.

16.0 **INSULATION:**

Insulation for the equipment's to be carried-out as per the details furnished in SOR Doc No. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B) and Equipment details for insulation (Doc. no. B957-80-42-EI-9501A & B957-80-42-EI-9501B).

Insulation of Equipment: Contractor scope includes procurement of all insulation materials hot as well as cold (wherever applicable) insulation including all ancillary material, transportation from supplier shop to Contractor yard, storing at Contractor's yard, transportation to erection site from Contractor's yard, protective covering, all consumables and other necessary materials, testing of the material as required, applying insulation on surfaces as specified, including all preparatory works thereon, all binding, tying, lacing, stitching and/or otherwise securing, providing Vapour barrier wherever applicable, finishing with plain/corrugated sheet cladding or as specified, providing bolts, rivets, self-tapping screws wherever specified, providing inspection windows etc. arranging necessary scaffolding, all tools and tackles, equipment, apparatus etc. labour

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and supervision and completing the work in all respect at all heights as per drawings, specifications and instructions of Engineer-in-Charge. Contractor to strictly follow the Insulation table for type and thickness for new equipment & existing drawings for modification equipment. For insulation, Contractor to fulfill the requirements given in EIL Standard specifications no. 6-79-0026 & 6-79-0027 for hot & cold service respectively.

17.0 BURIED VESSELS:

Site work for the Buried Vessels: The nozzle sections (refer site welding marked in the MDS) including internals and stiffeners shall be made fit up and welded on the vessel at the site to the satisfaction of Engineer in-charge. After the welding, full radiography, Local PWHT, draining, cutting, flushing and finishing of box, drying put of the vessel after completion of site work etc. shall be carried out to the satisfaction of Engineer-In-Charge. All tools and tackles, consumables and others required for the site work shall be in contractor scope of supply.

Checking the alignment of equipment in underground with all aspects, touch up paint, providing all tools and tackles, machinery. Consumables, transportation/handling of equipment, erection in sump, sand filling, labor etc. to complete the work in all respects for the items specified in SOR Doc No. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B attached elsewhere in tender.

18.0 HEAT EXCHANGERS

18.1 GENERAL

1. This section covers the minimum requirement for erection of Shell & Tube Heat Exchangers at site by an Erection Contractor.

Abbreviation used

EC	Erection contractor/turnkey contractor
EIC	Engineer-in-Charge (designated by EIL)
HEI	Heat Exchanger(s)
AEI	Air Cooled Heat Exchanger(s).

2. SCOPE OF WORK OF ERECTION CONTRACTOR

The scope of work for the EC as per schedule of quantities given in the mechanical tender shall include the following as a minimum:

2.1 Transportation of heat exchanger (HEI) as stipulated in Job specifications & Schedule of Rates.

2.2 Preparation of foundation by chipping & installation of base plates for foundations.

2.3 Erection of HEI on foundations.

2.4 Leveling, aligning, grouting and completing the work in all respect as per drawings, specifications and instructions of the EIC.

2.5 Hydro-testing of HEI if the time gap between last hydro-test is more than six months or in case it is found to be necessary by EIC or for the exchangers where bundle pullout check

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is required at site as per procedure given in Para 18.4 & 18.5.

2.6 The EC shall take care of Torquing/Tensioning and de-tensioning/de-torquing of equipment flange joints.

Pneumatic and Electric Torquing/tensioning machine to be deployed in sufficient numbers. In case of Pneumatic machine deployed by contractor, contractor to arrange compressor for air pressure. All bolting above 200 NB nozzle shall be tightened be by Torque wrench or BTD. No manual tightening is allowed.

2.7 Drying by passing compressed air and blinding off of HEI to prevent ingress of rain, dust, extraneous matter etc. as per Para 18.6 below.

2.8 The EC shall take proper care to avoid undesirable corrosion during various stages of erection and prior to pre-commissioning activity.

In addition to the above, EC may be called upon to do other jobs like rectification of defects etc. as per instructions of EIC.

18.2 SCHEDULE OF COST:

1. EC shall include in his cost for carrying out work as per Para 18.1 (2) above for HEI as given in the Doc. Nos. B957-80-42-EE-9501.

   All equipment, consumable and other Accessories required for completion of the job shall be arranged by the EC. This would include but not limited to, cranes, tools and tackles, manpower, machinery, instruments like plumb line, theodolite etc. for checking the erection, hydrostatic testing pumps, potable water, pressure gauge, hoses blinds etc. for hydrotesting and shims and wedges & other consumable for alignment & grouting.

2. EC shall also supply the base plate to be installed on the sliding foundation. The dimensions of the base plate shall be as per the foundation drawings enclosed with tender.

18.3 ERECTION OF SHELL & TUBE HEAT EXCHANGERS

1. HEI shall be erected with proper orientation on prepared foundation.

2. EC shall install base plate over the sliding end foundation before erection of HEI. The HEI shall then be erected, properly leveled and aligned with limits as below by providing necessary shims/wedges as required under the fixed support/base plate before grouting.

3. HEI shall be leveled properly after erection on the foundation. Difference in elevation of centerline from one end to the other end shall not be more than 1mm/m, limited to + 3mm maximum. Further, elevation difference shall be such as to ensure complete draining of HEI.

4. Leveling and plumpness shall be approved by EIC and shall be checked using theodolite before grouting and final finishing of the foundations. The record of the same shall be maintained.

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5. Instruments, as required shall be mounted on the HEI by EC. On instructions of EIC, EC shall also remove and handover the instruments to EIC for calibrations. During this period, EC shall cover all openings to protect the equipment.

6. EC to ensure that foundation bolts at the sliding saddle end are at the center of slotted holes & nuts at sliding end are only hand tightened. Projected bolt threads shall be properly protected by application of grease etc.

18.4 HYDRO TESTING

1. HEIs shall be hydrotested using potable water. Hydrotesting of both shell and tube sides shall be carried out as per procedure given below or as per instructions of EIC. For HEI's fitted with SS bellow or SS part, use potable water with max. 25 ppm chlorides for hydrotesting.

2. Suitable pump set, piping, test pressure gauges and other instruments, water-hoses, temporary gaskets, metallic blinds, bolts, nuts, consumable and other temporary arrangements and equipment for testing shall be provided by the EC at his cost. Test pressure gauges shall be calibrated by the EC and got approved from EIC.

3. Stacked HEIs shall be hydrotested in stacked conditions.

4. Test pressure shall be as indicated in the name plates mounted on each HEI. Duration of hydrotest shall be at least one hour. Test pressures and duration of hydrotest may be reduced by EIC. Minimum test water temperature shall be 20 °C.

5. Any defects noticed during hydrotesting shall be repaired by EC as per the procedure approved by EIC. Cost for rectifying defects, not attributable to the EC shall be paid separately.

6. No HEI shall in general, form part of the piping loop during hydrotesting and shall be blinded off, except when instructed otherwise by EIC.

7. EC to take adequate care during pressurizing & depressurizing the equipment. EC shall also take care of any instruction given regarding hydrotest in the HEI equipment drawing.

18.5 HYDRO TESTING PROCEDURE

1. Shell side & tube side shall be hydrotested separately.

2. The side, shell or tube which ever to be tested at higher pressure shall be taken first.

3. During hydrotest all gasket joints should be checked for any leakage. In case of leakage from any gasket joint, bolting at that joint shall be further tightened following proper tightening sequence (bolts should not be over tightened or tightened by hammering). In case it is not possible to stop leakage by bolt tightening, drain the water in exchanger & replace gasket at that joint by new gasket (gasket will be supplied by owner). After replacing gasket, exchanger must be again hydrotested with same procedure to ensure leak tightness.

4. In case of floating head heat exchangers, if it is found during hydrotest that the pressure is dropping, while the external gasketed joints are not leaking, this could be due to floating

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head gasket joint leakage. This shall be further investigated, by removing shell cover & pressurizing tube side to check the floating head gasket joint leakage. In case of leakage observed at floating head flange joint, replace floating head gasket by new gasket. After replacing gasket, exchanger must be again hydrotested first on tube side & then on shell side with same procedure to ensure leak tightness of gasket joints.
In case of heat exchangers with shell side hydrotest pressure higher than tube side, it is possible that above procedure (with tube side hydrotest to detect floating head gasket leakage) may not help. Absence of leakage during this test is not conclusive in such a case, as the shell side pressure was dropping during hydrotest. In such a case, floating head gasket shall in any case be replaced and then equipment retested to ensure leak tightness.

5. When hydrotested as per above procedure after floating head gasket replacement, if it is observed that test pressure is still dropping, this could mean leakage from tube to tubesheet joint. For such cases matter shall be reported to EIC for further investigations/instructions.

18.6 DRYING

1. After hydrotesting, HEI shall be completely drained of all water. It shall then be dried by passing dry compressed air. Air shall be passed for a sufficiently long time to ensure that no moisture is left. That the equipment has been properly dried shall be approved by the EIC.

2. After drying, HEI shall be blinded off to avoid any ingress of moisture/dust or any other extraneous matter.

   EC shall ensure that no HEI is subjected to any corrosion during any stage during his period of work till handing over to EIC/Client.

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LIST OF APPLICABLE DOCUMENTS

SL. NO.	DESCRIPTION	DOCUMENT NO.	REMARKS
	SCHEDUE OF RATES		
1.	Composite Works U & O Part-A (West side)	957-999-80-42-PK-SOR-9501-A	
2.	Composite Works U & O Part-A (East side)	957-999-80-42-PK-SOR-9501-B	
	JOB SPECIFICATION & OTHER APPLICABLE DOCUMENTS		
3.	Equipment details for Erection	B957-80-42-EE-9501	
4.	Equipment details for Insulation	B957-80-42-EI-9501	
5.	Job specification for Surface preparation and protective coating (SMMS)	B957-000-06-42-PLS-01	
6.	Scope marked P&ID for Chemical Cleaning of ECU	Refer Attachment	
7.	Job specification for pretreatment cum on-stream cleaning of recirculating fresh cooling water system	B957-000-06-42-CCS-001	
8.	Job specification for degreasing of carbon steel piping vessels & equipment in amine service	B957-000-06-42-CCS-003	
9.	Job specification for chemical cleaning & passivation of compressor circuits	B957-000-06-42-CCS-005	
	EIL STANDARD SPECIFICATIONS		
10.	Standard specification for hot insulation of vessels, piping and equipment's	6-79-0026	
11.	Standard specification for cold insulation of vessels, piping and equipment.	6-79-0027	
12.	Standard specification for rockwool insulation	6-79-0040	
13.	Standard Specification for erection of equipment and machinery	6-76-0001	
14.	Specification for quality management system requirements from bidders	6-78-0001	
15.	Specification for documentation requirements from contractors	6-78-0002	
	EIL STANDARDS		
16.	Vessel tolerances	7-12-0001	
17.	Support for Horizontal Vessel	7-12-0002	
18.	Wooden pillows for saddle support.	7-12-0003	

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19.	Angle Leg Support	7-12-0006	
20.	Pipe Leg Support	7-12-0007	
21.	Fire proofing & insulation supports	7-12-0025	
22.	Hot Insulation supports for horizontal vessel	7-12-0033	
INSPECTION AND TEST PLAN			
23.	Standard specification for positive material identification (PMI) at supplier's work	6-81-0001	
24.	Standard specification for health, safety & environment (HSE) management at construction sites	6-82-0001	
25.	Standard specification for positive material identification at construction sites	6-82-0002	
26.	Inspection and test plan (ITP) for general works (item rate contracts with categorization)	6-82-3300	
27.	Inspection and test plan (ITP) for mechanical works (item rate contracts with categorization)	6-82-3200	
MECHANICAL DATASHEETS FOR VESSELS			
28.	MDS FOR CLOSED BLOW DOWN VESSEL Item No: 500-VV-HI-003	B957-500-80-42-DS-3203	PART-A
29.	COLD BLOWDOWN KO DRUM Item No: 500-VV-HI-004	B957-500-80-42-DS-3211	PART-A
30.	COLD CONDENSATE RECOVERY DRUM Item No: 500-VV-HI-005	B957-500-80-42-DS-3205	PART-A
31.	AROMATIC BLOWDOWN VESSEL-1 (TF-20) Item No: 500-VV-HI-006	B957-500-80-42-DS-3206	PART-A
32.	START-UP ETHYLENE CONDENSRECOVERY Item No: 500-VV-HI-009	B957-500-80-42-DS-3209	PART-A
33.	BUTENE-1 UNLOADING KOD Item No: 500-VV-VI-003	B957-500-80-42-DS-3210	PART-A
34.	PROPYLENE KOD Item No: 500-VV-VI-004	B957-500-80-42-DS-3204	PART-A
35.	AROMATIC BLOWDOWN VESSEL-II Item No: 500-VV-HI-001	B957-500-80-42-DS-3201	PART-B
36.	AROMATIC BLOWDOWN VESSEL-III (500-VV-HI-007)	B957-500-80-42-DS-3207	PART-B
37.	OFF-SPEC ETHYLENE B/D CON RECOVERY (500-VV-HI-008)	B957-500-80-42-DS-3208	PART-B

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38.	ISOPENTANE MOUNDEDBULLET Item Tag No: 510-TT-00-003A/B	B957-510-80-42-DS-3001	PART-B
SETTING PLAN & SECTION DRAWING OF HEAT EXCHANGER			
39.	COLD BLOWDOWN VAPORIZER Item No:500-EE-AT-001	B957-500-80-42-DS-4011	PART-A
40.	COLD BLOWDOWN SUPERHEATER Item No: 500-EE-AT-002	B957-500-80-42-DS-4012	PART-A
41.	ETHYLENE START-UP HEATER No: Item 500-EE-AT-003	B957-500-80-42-DS-4003	PART-A
42.	OFFSPEC ETHYLENE BLOWDOWNSUPERHEATER 500-EE-AT-004	B957-500-80-42-DS-4004	PART-B

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SECTION B: PACKAGED EQUIPMENT

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1.0 GENERAL

1.1 The Contractor shall receive the equipment/packages from owner's store and shall arrange lifting and transportation to the site of installation. The Contractor shall then execute the job as per schedule to be finalized in consultation with the Engineer-in-Charge. The quantities, indicative level of installations and approximate weights are as mentioned under clause 6.0; SOQ (Schedule of Quantities).

1.2 The contractor shall take proper care to avoid damage to painting during various stages of erection and prior to pre-commissioning activity.

2.0 SCOPE OF SUPPLY AND SERVICES FOR PACKAGED EQUIPMENT ITEMS

Items listed in **cl. no. 6.1** shall be issued as **free issue materials** by the owner. The erection, installation, testing and commissioning of the above said items shall be in the scope of the contractor.

The intent of this specification is to specify detailed scope of work, scope of supply and services for installation and commissioning as specified below.

2.1 Lifting of Equipment / Skid Mounted Packages at owner's store.

2.2 Transportation of Equipment / Skid Mounted Packages from owner's store to site of installation.

2.3 Minor chipping of foundation (if required).

2.4 Placing, leveling, aligning, fixing and grouting (including supply of grouting material) of Equipment / Skids on the foundations.

2.5 For Skid mounted pumps/compressors, initial alignment & alignment with piping shall be checked by the erection contractor and corresponding modification work if any, required for completing the alignment.

2.6 Installation of interconnecting piping, hook-up/connection of the Equipment with the plant piping and control system as per vendor drawings (*drawing will be provided during erection).*

2.7 Modification of prefabricated spools as per site condition.

2.8 Field joints, if any, in the loose supplied items shall also be in erection contractor's scope including radiography and other NDT requirements.

2.9 Installation of any other loose items (Control valves, PSV, online items, etc.) supplied by package Vendor.

2.10 Repair and touch-up painting for the locally damaged areas of the equipment and field welding of piping shall be carried out by the erection contractor as per EIL/Owner painting specification attached in the tender document.

2.11 Application of insulation material (free issue material) for the field joint portion, un-insulated part of the package which has been left for erection purpose

2.12 Hydro-testing/ Pneumatic testing of the installed piping for the above said packages, if required.

2.13 Erection Equipment (like crane, etc.) required for installation and commissioning of all items and components at all elevations including arrangement and installation of temporary scaffolding.

2.14 Preservation of rotary equipment specially entry from foreign materials until handing over to Client shall be specified

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2.15 Final inspection and punch list liquidation of vessel/ equipment along with EIL/Client and handing over to Client in all aspect shall be included.

2.16 Assistance to Performance Guarantee test for packages by providing skilled and unskilled labour and handover to owner.

2.17 All labour, materials, facilities and supplies required during installation, testing and commissioning.

2.18 In addition to the above, contractor may be called upon by Engineer-in-Charge to do other jobs like rectification of defects etc. in the said packages.

3.0 Technical Requirement

3.1 Chain Pulley Blocks

3.1.1 Chain pulley blocks and geared trolleys suitable for hazardous area shall be supplied, installed, shop tested, commissioned in position including any modifications required in the already installed structures based on the Structural and Piping drgs. and as per the instruction of the Site –In charge.

3.1.2 Contractor shall procure the chain pulley blocks & geared trolleys from the EIL approved vendors. For vendor list contractor to refer ANNEXURE-1 of this document.

3.1.3 Mechanical erection contractor shall procure, test, paint, install the chain pulley blocks & geared trolleys in line with EIL std specification no.: 6-61-0015, attached with this tender. Chain Pulley Block shall be of detachable type suitable for mounting on geared trolley of same rating /capacities.

3.1.4 Painting (Primer +finish coats) of the chain pulley blocks & geared trolleys shall be as per manufacturer standard and shall be suitable for highly corrosive industrial environment.

3.1.5 Contractor shall ensure that the chain pulley blocks and geared trolleys are supplied with commissioning spares of adequate quantity.

3.1.6 Contractor shall ensure that chain pulley blocks and geared trolleys are supplied & installed with first fill of lubricants and grease nipple points are provided suitably.

3.1.7 Contractor shall submit the documentation as per doc no. B957-999-80-42-VDR-9501 attached elsewhere in the tender.

3.1.8 Contractor shall ensure that the chain pulley blocks & geared trolleys are supplied with statutory approvals and formats, as applicable. Each Chain Pulley Block and Trolley shall be marked with the tag no., SWL capacity & “Non-Sparking Type”.

4.0 ERECTION

4.1 Complete erection of packages / equipment & piping works etc. under supervision of respective package / equipment supplier as per EIL standard specification no.6-76-0001. The overall coordination shall be Contractor’s responsibility.

4.2 Equipment shall be erected with proper orientation on foundation.

4.3 Contractor shall install base plates, erect equipment, level and properly align with necessary shims and wedges wherever applicable.

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4.4 Leveling and plumbness shall be approved by EIL and shall be checked using suitable instruments as to be decided by Engineer-in-Charge before grouting / fixing. Finishing of the foundation shall be carried out, wherever applicable.

4.5 Equipment shall be firmly bolted down to foundations, wherever applicable.

5.0 EXCLUSIONS

Civil Foundation. However, minor chipping of foundation (if required) and grouting of equipment (including supply of grouting material) shall be in contractor's scope.

6.0 SCHEDULE OF QUANTITIES

The schedule of quantities is as given below. Dimensions and weights are approximate only. Final data along with equipment manufacturer's drawings will be furnished during erection of equipment to the successful contractor.

6.1 **Packages/ Equipment to be erected**

6.1.1 **Vapour Recovery System** (Refer Item no. 01QQ.3.48 of SOR Doc. no. B957-999-80-42-MR-SOR-9501-A & B957-999-80-42-MR-SOR-9501-B)

S. N.	Equipment Tag No.	Service	Approx. Erection Weight (MT)	Approx. Overall Dimension (L X W X H) (meter)	Elevation from grade (in meters)	Remarks
1.	500-LZ-00-003	Benzene	130	20 X 25 X 15	EL +0.000 (Refer equipment layout attached elsewhere)	
2.	500-LZ-00-019	Toluene	130	20 X 25 X 15		
3.	500-LZ-00-020	Xylene	130	20 X 25 X 15		
4.	500-LZ-00-021	HC Vapour	130	20 X 25 X 15		
5.	All skid interconnecting piping, fittings, structure support, insulation, control valves, all types of instruments etc.					

Note:

1. Sizes & Elevation of equipment / skids / Piping mentioned above are tentative. Actual GA drawing of individual equipment & package layout will be given to successful bidder. For the estimation purpose, bidder shall refer the equipment layout showing the location of individual equipment.
2. Actual weight of equipment shall be as per AFC drawing, which will be given to successful bidder.
3. Prefabricated piping along-with some loose free length piping and fittings shall be supplied by package vendor. Welding, some amount of cutting & re-welding may be required to adjust the lengths at site. Bidder shall erect all loose prefabricated piping / free length piping between equipment and skids. Actual isometrics and layout will be given to successful bidder.

6.1.2 **Bagging and Palletizing Package (Tag no.540-LZ-101-104/105/106/107-119/120-122/123-125)**

(Refer Sl. No. 01QQ.3.4 of SOR doc. No. B957-999-80-42-MR-SOR-9501-A)

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Size, Erection weight are tentative. Actual details shall be as per approved vendor drawings provided at the time of erection.

Description of the Machines-

1. 25 kgs FFS – 17 machines
2. Big Bag (1 Ton) – 4 machines
3. Bulk Loader – 4 machines

Overall estimated weight for Bagging and Palletizing Package shall be approximately 640 MT.

Major items which are a part of this package are listed below for Contractor's information.

Sl. No	Equipment Tag No.	Equipment Description	Qty. (Lot/ Nos.)	Approx. Weight (MT) / Equipment	Total Approx. Weight (Note-1) (MT)	Elevation from Grade (m)
1.	Not Applicable	Buffer Hopper	17	0.4	7	Grade
2.	Not Applicable	Automatic Film-Reel Changing System	17	0.11	2	Grade
3.	Not Applicable	Complete Bagging machine along with all accessories & supporting structure	17	8.64	147	Grade
4.	Not Applicable	Bag Carrying-off Conveyor	17	0.11	2	Grade
5.	Not Applicable	Checkweigher	17	0.029	0.5	Grade
6.	Not Applicable	Metal detector along associated conveyors/supports	17	0.4	6.5	Grade
7.	Not Applicable	Manual Palletizing System.	17	0.11	2	Grade
8.	Not Applicable	Product Recycling System for broken bags	17	0.11	2	Grade
9.	Not Applicable	Bag Forming and Pressing Unit	17	0.029	0.5	Grade
10.	Not Applicable	Empty Pallet Magazine and Dispenser	17	0.029	0.5	Grade
11.	Not Applicable	Carton / PE Sheet Dispenser	17	0.029	0.5	Grade
12.	Not Applicable	Cold Glue System	17	0.029	0.5	Grade
13.	Not Applicable	Bar Code Reader for Empty Pallets	17	0.029	0.5	Grade
14.	Not Applicable	Palletizer along with supporting structure and all related conveyors	17	12.52	213	Grade
15.	Not Applicable	Static weighing system for 50kg	17	0.058	1	Grade
16.	Not Applicable	Ink-jet printer (with 2-printing head) along associated conveyors/supports	17	0.11	2	Grade
17.	Not Applicable	Bag rejecter along associated conveyors/supports	17	0.64	11	Grade
18.	Not Applicable	Stretch Hooder machine along with all accessories & supporting structure and all related conveyors	17	5	85	Grade

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19.	Not Applicable	Complete Big-Bag machine along with all accessories & supporting structure and all related pallet conveyors	4	26.75	107	Grade
20.	Not Applicable	Ink-jet printer (with 1-printing head) along associated conveyors/supports	4	0.25	1	Grade
21.	Not Applicable	Bar Code Reader for Empty Pallets	4	0.125	0.5	Grade
22.	Not Applicable	Static weighing system for 1200kg	4	0.25	1	Grade
23.	Not Applicable	Loose structure and other accessories	-	-	30	Grade
24.	Not Applicable	Bulk Loader	4	4.25	17	Grade
	Total Approximate Erection Weight				**640**	

Notes:

1. Actual weight of equipment shall be as per approved drawing which will be given to successful bidder.
2. Prefabricated piping along-with some loose free length piping and fittings shall be supplied by package vendor. Welding, some amount of cutting & re-welding may be required to adjust the lengths at site. Bidder shall erect all loose prefabricated piping / free length piping between equipment and skids. For the estimation purpose, bidder shall refer building layout attached with tender (Dwg. No. B957-540-80-42-10001/10002) (These drawings are only for reference. Scope demarcation etc. is not to be considered). Actual isometrics and layout will be given to successful bidder.

6.1.3 **Road/Truck Loading arm (**Refer Sl. No. 01QQ.1.7 of SOR doc. No. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B)

S. No.	Equipment Tag No.	Qty	Fluid Handled	Type	Approx. Size (Dia.)	Approx. Erection weight (MT)	Total weight (MT)
1.	500-LZ-00-004/005/006/007 A	4	Benzene	Bottom	3”	0.6	2.4
2.	500-LZ-00-004/005/006/007 B	4	Benzene	Bottom	3”	0.6	2.4
3.	500-LZ-00-008/009/022 A	3	Toluene	Bottom	3”	0.6	1.8
4.	500-LZ-00-008/009/022 B	3	Toluene	Bottom	3”	0.6	1.8
5.	500-LZ-00-010/023 A	2	Xylene	Bottom	3”	0.6	1.2
6.	500-LZ-00-010/023 B	2	Xylene	Bottom	3”	0.6	1.2
7.	500-LZ-00-011/012/013/024	4	PFO	Bottom	4”	0.6	2.4
8.	500-LZ-00-014/015 A	2	Propylene	Bottom	4”	0.6	1.2
9.	500-LZ-00-014/015 B	2	Propylene	Bottom	4”	0.6	1.2
10.	500-LZ-00-016 A	1	Butene	Bottom	4”	0.6	0.6
11.	500-LZ-00-016 B	1	Butene	Bottom	4”	0.6	0.6
Total Equipment Erection Weight (MT)							16.8

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Quantity & type mentioned above are estimated and may be changed during detail engineering. Payment to the contractor shall be made based on the actual quantity erected and quoted unit rate against the item.

Note:

1. Tag no. will be provided to successful contractor during detail engineering.
2. Sizes & Elevation of equipment / skids / Piping mentioned above are tentative. Actual GA drawing of individual equipment & package layout will be given to successful bidder. For the estimation purpose, bidder shall refer the equipment layout showing the location of individual equipment.
3. Actual weight of equipment shall be as per AFC drawing, which will be given to successful bidder.
4. Prefabricated piping along-with some loose free length piping and fittings shall be supplied by package vendor. Welding, some amount of cutting & re-welding may be required to adjust the lengths at site. Bidder shall erect all loose prefabricated piping / free length piping between equipment and skids. Actual isometrics and layout will be given to successful bidder.

6.2 **Equipment to be fabricated**

Nil

6.3 **Equipment to be procured and erected**

6.3.1 **Chain Pulley Block & Gear trolley (Hazardous Area):**

(Refer Sl. No. 01QQ.7.1, 01QQ.7.2, 01QQ.7.4, 01QQ.7.5, 01QQ.7.6 & 01QQ.7.7 of SOR doc. No. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B)

Following items shall be supplied and erected by the Contractor as per attached EIL Std. Specification for Chain Pulley Block (Doc. No. 6-61-0015), and Cl. No. 3.1 of this document. Chain pulley blocks supplied shall be suitable for Hazardous area application.
Chain Pulley Block (CPB), as indicated in the AFC drgs. and as per the tag no. and respective maintenance equipment shall be installed in position, as per the instruction of Site in Charge.

Sl. No	Description	Qty.	Capacity * (MT)	Remarks
a.	Chain Pulley Blocks (Trolley mounted / hook mounted)	32	1 MT to 15.0 MT	* - As per the AFC drawing of Piping & structural and vendor drawing.

Quantity mentioned above are estimated and may be changed during detail engineering. Payment to the contractor shall be made based on the actual quantity erected and quoted unit rate against the item.

6.4 **Equipment to be painted**

Repair and touch-up painting for the locally damaged areas of the free issue packages shall be carried out by the erection contractor as per EIL/Owner painting specification attached elsewhere in the tender document.

6.5 **Equipment to be Insulated**

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Application of insulation material (free issue material) for the field joint portion, un-insulated part of the package which has been left for erection purpose, repair and touch-up insulation for the locally damaged areas of the above packages shall be carried out by the erection contractor as per EIL/Owner instruction.

7.0 ENCLOSURES

7.1 Schedule of Rates for mechanical works, SOR (doc. No. B957-999-80-42-PK-SOR-9501-A & B957-999-80-42-PK-SOR-9501-B)

7.2 Data sheet of chain pulley block (Doc no. B957-999-80-42-DS-9501)

7.3 Vendor Data Requirement (Static & Machinery Equipment) (Doc no. B957-999-80-42-VDR-9501)

7.4 EIL Standard Specification no.6-61-0015.

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ANNEXURE-1

PMVL for BPREP Project of BPCL at Bina Refinery, Madhya Pradesh

Date :30/11/2025

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 07AH		**Description :** CHAIN PULLEY BLOCK		
Approved Suppliers				
1	3921	BAKELITE ELECTRICAL MFG CO.PVT LTD	INDIA	
2	H129	HERCULES HOISTS LTD	INDIA	
3	T038	TRACTEL TIRFOR (I) PVT LTD	INDIA	
4	W005	BRADY & MORRIS ENGINEERING CO. LTD.	INDIA	
5	BPCL VC 100008	A.K. MARINE & INDUSTRIAL APPLIANCES	INDIA	
6	BPCL VC 101038	MACHINERY IMPEX CORPORATION	INDIA	
7	BPCL VC 372218	DAMAN INTERNATIONAL	INDIA	
8	BPCL VC 180128	INDIAN CHAIN PVT LTD	INDIA	
9	BPCL VC 101897	W. H. BRADY & CO. LTD.	INDIA	
10	BPCL VC 101914	WESTERN INDIA MARINEMILLS&ENGINEERS	INDIA	

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SECTION C: ROTATING EQUIPMENT

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SCOPE OF WORK & SUPPLY

1. SCOPE

1.1 The intent of this document is to outline the **Contractor's Scope** for all rotating equipments including all associated works as required for **REFINERY FACILITIES RELATED TO BPREP-BPCL**, comprising of following units:

- **PART-A: West side of Nallah**
- **PART-B: East side of Nallah +BDT**

1.2 Contractor shall carry out erection and commissioning of the following Rotating Equipments & Miscellaneous items of package as specified in below tables (refer Table A.1) which shall be given to the Contractor by the Purchaser as Free Issue Materials (FIM):

Table A.1

S. NO.	EQUIPMENT TAG NO.	QTY	EQPT. DESC.	EQUIPMENT TYPE	LOCATION
PART-A: West side of Nallah					
1	500-KA-RP-002 A/B	2	Propylene Unloading Compressor	Horizontal Reciprocating Gas Compressor	ECU Feed & Intermediate Tanks
2	500-KA-RP-003 A/B	2	Butene-I Unloading Compressor	Horizontal Reciprocating Gas Compressor	ECU Feed & Intermediate Tanks
3	500-PA-SM-003 A/B	2	Cold Condensate Recovery Pumps	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
4	500-PA-SM-004 A/B	2	Aromatic Blowdown Of TF-20	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
5	500-PA-SM-005 A/B	2	HC Closed Blowdown in Petchem Gantry	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
6	500-PA-SM-009 A/B	2	Start-up Ethylene Condensate Recovery Pumps	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
7	500-PA-CF-005 A/B	2	Ethylene Unloading Pump	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
8	510-PA-CF-005 A/B	2	ISO-Pentane Unloading Pump	Vertical Centrifugal Pump (VS6)	Chemical Tanks
9	530-PA-CF-101 A/B	2	ECU LP Flare KOD Pumps	Vertical Centrifugal Pump (VS6)	Flare System
10	530-PA-CF-102 A/B	2	Polymer LP Flare KOD Pumps	Vertical Centrifugal Pump (VS6)	Flare System

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11	530-PA-CF-103 A/B	2	LLP Flare KOD Pumps	Vertical Centrifugal Pump (VS6)	Flare System
12	530-PA-CF-104 A/B	2	Acid Flare KOD Pumps	Vertical Centrifugal Pump (VS6)	Flare System
13	999-PA-RL-8131 A/B	2	Oily Waste Water (OWS)	Rotary Lobe	Offsite
14	999-PA-RL-8132 A/B	2	Oily Waste Water (OWS)	Rotary Lobe	Offsite
15	999-PA-RL-8134 A/B	2	Oily Waste Water (OWS)	Rotary Lobe	Offsite
16	999-PA-RL-8135 A/B	2	Oily Waste Water (OWS)	Rotary Lobe	Offsite
17	999-PA-RL-8231 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
18	999-PA-RL-8232 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
19	999-PA-RL-8235 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
20	999-PA-RL-8237 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
21	999-PA-RL-8238 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
22	999-PA-RL-8239 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
23	510-PA-CF-003 A/B/C	3	Hexene Transfer Pumps	Vertical Centrifugal (OH6)	Chemicals Tanks
24	500-PA-CF-010 A/B	2	RPG Transfer Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
25	500-PA-CF-011 A/B	2	BTX Feed Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
26	500-PA-CF-015 A/B	2	Flux / Wash Oil Unloading Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
27	500-PA-CF-024 A/B	2	Off-Spec Aromatics (BTX) Transfer Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
28	500-PA-CF-025 A/B	2	C9-180 DEG C Cut Transfer Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
29	510-PA-CF-001 A/B	2	Hexane Transfer Pumps	Horizontal Centrifugal Pump (OH2)	Chemicals Tanks
30	510-PA-CF-002 A/B	2	Hexane Unloading Pumps	Horizontal Centrifugal Pump (OH2)	Chemicals Tanks
31	510-PA-CF-004 A/B	2	Hexene Unloading Pumps	Horizontal Centrifugal Pump (OH2)	Chemicals Tanks
32	410-PA-CF-101 A/B/C/D/E/F/G/H/I/J/ K/L/M	13	Cooling water pumps (CT-1)	Horizontal Centrifugal	Cracker Reciculation Cooling Water system (CT-1)

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33	411-PA-CF-101 A/B/C/D/E/F/G/H/I	9	Polymer Block CW Recirculation Pumps (CT-2)	Horizontal Centrifugal	Polymer Cooling Water System (CT-2)
34	410-PT-00-108	1	Polymer Emergency CW Recirculation Pump-2	Horizontal Centrifugal	Cracker Reciculation Cooling Water system (CT-1)
35	410-PM-00-109	1	Polymer Emergency Cooling Water Recirculation 1	Horizontal Centrifugal	Cracker Reciculation Cooling Water system (CT-1)
36	411-PT-00-109	1	Polymer Emergency Cw Recirculation Pump-2	Horizontal Centrifugal	Polymer Cooling Water System (CT-2)
37	411-PM-00-108	1	Polymer Emergency Cooling Water Recirculation Pump	Horizontal Centrifugal	Polymer Cooling Water System (CT-2)
38	401-PA-CF-23100 A/B/C/D	4	Raw Water Pump	Vertical Centrifugal Pump (VS1)	Treated Raw Water System
39	999-PA-CF-8240 A/B/C/D	4	Storm Water Pump	Vertical Centrifugal Pump (VS1)	Storm Water Eco Pond
40	441-PA-CF-101 A/B	2	Intermediate Flare KOD Blowdown Pumps	Vertical Centrifugal Pump (VS6)	Utility Interconnection
41	530-LZ-00-101	1	FGRS	LRVP Package	Flare System
PART-B: East side of Nallah +BDT					
1	500-PA-CF-004 A/B	2	Offspec Ethylene Pumps	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
2	500-PA-CF-006 A/B/C	3	Propylene Transfer Pumps	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
3	500-PA-CF-007 A/B	2	Offspec Propylene Pumps	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
4	500-PA-CF-009 A/B/C	3	Butene-1 Transfer Pumps	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
5	500-PA-CF-012 A/B	2	Raw C4 Mix/ Offspec Butene-1 Transfer Pumps	Vertical Centrifugal Pump (VS6)	ECU Feed & Intermediate Tanks
6	500-PA-SM-008 A/B	2	Offspec Ethylene B/D Condensate Recovery Pumps	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
7	600-PA-CF-001 A/B/C	3	Naphtha Unloading Pumps	Horizontal Centrifugal Pump (OH2)	Marketing Terminal
8	402-P-1001 A	1	Fire water Main pump (Electric motor driven)	Vertical Centrifugal	Fire Water System
9	500-PA-SM-006 A/B	2	Aromatic Blowdown of BDT Tanks	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks

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10	500-PA-SM-007 A/B	2	Aromatic Blowdown of BDT P/H	Vertical Centrifugal Pump (VS1)	ECU Feed & Intermediate Tanks
11	510-PA-CF-006 A/B	2	Isopentane Transfer Pumps	Vertical Centrifugal (OH6)	Chemicals Tanks
12	500-PA-CF-016 A/B	2	Benzene Loading Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
13	500-PA-CF-017 A/B	2	Toluene Loading Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
14	500-PA-CF-018 A/B	2	Mixed Xylene Loading Pumps	Horizontal Centrifugal Pump (OH2)	ECU Feed & Intermediate Tanks
15	500-PA-CF-019 A/B	2	PFO Loading Pumps	Horizontal Centrifugal Pump (BB2)	ECU Feed & Intermediate Tanks
16	999-PA-RL-8133 A/B	2	Oily Waste Water (OWS)	Rotary Lobe	Offsite
17	999-PA-RL-8233 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
18	999-PA-RL-8234 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite
19	999-PA-RL-8236 A/B	2	Sanitary Waste Water (SWS)	Rotary Lobe	Offsite

2. PREPARATION FOR MECHANICAL ERECTION OF ROTATING EQUIPMENT & MISCELLANEOUS ITEMS

2.1 Vendor's representatives shall be present at site only for supervision of erection and pre-commissioning work. However, total responsibility for this shall be of Contractor. The entire material shall be issued to the Contractor by the Engineer-in-Charge. The Contractor will return all the unused material / items identified as per the packing list to Engineer-in-Charge to store at the Owner's store.

2.2 The Contractor shall carefully study the vendor drawings, manuals and other data before start of the job to ensure correct erection, alignment and commissioning.

2.3 Material opened from vendor supplied boxes after open box installation shall be stacked/stored equipment/package wise. The Contractor shall arrange for visual inspection of all vendor equipment in line with manufacturer's drawing and maintain a record.

2.4 Reconciliation of material issued and return special tools and unused material / spare items to warehouse as per the packing list.

2.5 The Contractor shall make sure from the vendor's drawing and data that whether there is any transportation dummy provided in the equipment or its auxiliaries and accessories or not. If such dummy has been provided the same shall be removed by the contractor before starting the erection activities. Preservation made by vendor shall be maintained by the Contractor.

2.6 In case the Rotating Equipment is received in knocked down condition, the various parts shall be assembled as per the instructions of the Engineer-in-Charge and as per manufacturer's instructions. On the basis of the part list and the handling procedures

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provided with the equipment, the Contractor shall make suitable arrangements to move the assemblies and sub-assemblies to the site. All parts of the equipment shall be thoroughly cleaned with solvents to remove protective compounds if any, before assembly. Contractor shall follow OEM recommended procedures for cleaning.

2.7 All protective and safety guards shall be installed and all foundation bolts shall be checked before starting the trial runs.

2.8 All Alignment shall be done by Laser Alignment only for all rotating equipment.

2.9 All the rotating equipment package erection shall be done by the Qualified technical personal. Contractor shall depute qualified technical personal for carry out erection, installation and commissioning of rotating equipment. The contractor shall engage qualified rotary equipment overhauling contractors for carrying out all rotary equipment jobs from grouting to commissioning. Qualified technical personal shall possess minimum 10 years of relevant experience.

2.10 Preservation of rotary equipment including barring, LO flushing/greasing, nitrogen charging (if required) and associated preservation activities shall be in contractor scope as instructed by EIC. A dedicated preservation team incl MWF with one supervisor shall be deployed.1 Team=1 Supervisor+1MWF+3 Riggers.

2.11 All type of Special consumables required by Pump/turbine/compressor/vendor specifications shall be included in contractor scope supply and shall be provided.

2.12 Contractor shall provide all measuring, testing and other tools required to complete mechanical jobs as directed by EIC, including specialized instruments.

2.13 Epoxy grouting of equipment bases, grout pads and associated surfaces shall be included in contractor's scope. During grouting of Rotary equipment, contractor to include supervision of grouting by OEM of Grouting material (GP2 and epoxy or OEM recommended grout material etc..) at site.

2.14 Correction of soft foot on Motors and rotating equipment shall be in contractor scope.

2.15 Alignment of all the rotary equipment shall be done only by Laser alignment kit at site. And Laser Kit alignment report shall be generated and submitted with Package commissioning report.

2.16 Blue matching of sole plate for all the rotary equipment is in contractor scope.

2.17 Alignment of vertical equipment shall be done through total station only.

2.18 Alignment of all Rotary equipment like pumps/compressors etc. and its auxiliary skids are in contractor's scope.

2.19 Alignment of all rotary equipment shall be carried out in all respects as per OEM recommendation.

2.20 Decoupling and recoupling with prime-movers during no-load/loads trials for multiple occasions is in Contractor's scope.

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2.21 Two (2) sets of laser alignment tools of size covering all equipment of plant shall be provided and handed over to BPCL upon completion of works.

3. ERECTION OF EQUIPMENTS (LISTED IN TABLE A.1 ABOVE)

3.1 The Contractor shall use the proper specified/supplied material handling equipment / lifting tools and manufacturer recommended / safe handling procedure for erection of the equipment and their driver and auxiliaries / accessories. The Contractor shall submit erection scheme along with details of proposed lifting tools.

3.2 The Contractor shall ensure that the lifting tools/ accessories are attached to the equipment at the place where is has been recommended by the manufacture. In case the manufacturer has not recommended the place of attaching the lifting tools/ accessories on the equipment, the Contractor shall decide the place in consultation with the Engineer-in-charge to ensure that no damage is occurred to the equipment or any part of that.

3.3 The alignment between driver and driven equipment of the complete train shall be rechecked and corrected as per the recommendations of the equipment manufacturer. The readings of final alignment shall be verified by the Engineer-in-charge.

4. PRECOMMISSIONING WORK (LISTED IN TABLE A.1 ABOVE)

4.1 All the piping i.e. either main or auxiliary (for utilities) shall be cleaned (steam / water flushing) and then complete connections shall be made. The manpower as required for this purpose shall be provided by the Contractor depending on the contract / P.O. All site fabricated piping shall be hydro tested.

4.2 The Contractor shall carryout initial charge (for flushing/cleaning of systems) of the lubricants. All the oil systems shall be run, flushed and the oils changed by fresh charge. Unless otherwise specified, all lubricants shall be supplied by the Contractor, including the initial charge.

4.3 Contractor shall note that lubricants, sealing fluid & other consumables etc. required for startup and commissioning of free issue Items shall be included in Contractor's scope of supply. A consolidated list for all free issue items shall be provided to Contractor indicating type of lubricant, grease, oil etc. giving specifications, quantities, brand name and their BPCL equivalent.

4.4 Cooling Water System, Lube Oil System and all other auxiliary systems shall be run / operated at rated pressures and the leaks shall be checked and corrected.

4.5 All flushing work shall be done with temporary strainers (as applicable) or with the temporary fine mesh SS sheets (exact mesh size to be confirmed by OEM/ Engineer in-charge) and after final cleanliness & clearance, permanent strainer shall be installed.

4.6 Temporary piping required for flushing, chemical cleaning, blowing shall be fabricated and erected by the Contractor. If not supplied by the vendor, temporary strainer for flushing shall be arranged by the Contractor.

4.7 In case of pump's mechanical seal leakage during pre-commissioning, the Contractor shall arrange for disassembly, transportation of pumps from site to Owner's workshop & back to site and again reassemble & align at site as per the instructions of Owner/Engineer-in-Charge *(Seal repair at workshop will be done by Owner)*.

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4.8 The Contractor shall carryout all other pre-commissioning activities as deemed necessary and as per the instructions of the engineer in-charge.

4.9 Requirement of mobilization of the package / equipment supplier representative for supervisory services shall be intimated to Engineer in Charge 45 days in advance by the Contractor. Specific activity list, along with requirement of labor (skilled / unskilled) and erection equipment required for carrying out specific activity shall be obtained by the Contractor from the package / equipment supplier representative, through Engineer in Charge. The Contractor shall ensure to provide the desired manpower, equipment required for erection works, as deemed necessary by the package / equipment supplier representative. The overall coordination shall be the Contractor's responsibility.

4.10 Unless indicated to the contract, all the rotating equipment will be subjected to trial runs for a continuous operation of 72 hours. In case of motor driven rotating equipments, motors shall be decoupled and turned over for testing and no load running of motors. After the no load runs of motors are satisfactorily completed, the Contractor shall recouple the motors to the rotating equipment and recheck the alignment. The trial run of the rotating equipment shall be started only after the above is completed. Contractor shall provide, as part of his work, necessary skilled personnel (excluding the operating personnel) for conducting the trial runs round the clock during the trial runs period. Final inspection of bearing etc. shall be carried out by the Contractor after the Machinery had gone through the trial run and defects if any, shall be made good for rendering the rotating equipment ready for start-up. Defects due to Contractor's fault noticed during trial runs shall be rectified by him.

8. HANDING OVER FOR COMMISSIONING

8.1 The Contractor shall arrange for removal of all scrap and debris generated during erection activities from the site before handing over the equipment for commissioning activities and transporting the same as within or outside the plant as per instruction of Engineer-in-Charge or as specified elsewhere.

8.2 After the mechanical completion while handing over to the client or to the commissioning agency, the Contractor shall provide a list of construction defects, rectified by them. The Owner or commissioning agency will check the Contractor's work before taking over.

8.3 The Contractor shall also provide a team of skilled labor to client or to the commissioning agency during their commissioning period if requisitioned by them.

8.4 If some defects are noticed during commissioning and are attributed to Contractor, the Contractor shall arrange to rectify to the satisfaction of Engineer-in-Charge.

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ANNEXURE – 1 (MECHANICAL ERECTION & PRE-COMMISSIONING WORK)

PART-A: UNITS (U&O)

A.0 SCHEDULE OF QUANTITIES FOR ALL TYPE OF ROTATING EQUIPMENTS & MISCELLANEOUS ITEMS WITH DRIVERS AND ACCESSORIES

A.1 SCHEDULE OF QUANTITIES (SOQ) FOR ALL TYPE OF PUMPS WITH DRIVERS AND ACCESSORIES (SOR Item No. 01RR.1.1.1 & 01RR.1.1.2 as per Doc # B957-999-80-42-PK-SOR-9501-A):

S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Pump	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump (LXBXH) (m)
1	500-PA-SM-003 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 8 (installation depth)
2	500-PA-SM-004 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 8 (installation depth)
3	500-PA-SM-005 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 8 (installation depth)
4	500-PA-SM-009 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 6 (installation depth)
5	500-PA-CF-005 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*4.8=9.6	2.5 x 1.5 x 8.0 (installation depth)
6	510-PA-CF-005 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3.2=6.4	2.5 x 1.5 x 8.0 (installation depth)
7	530-PA-CF-101 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3.2=6.4	2.5 x 1.5 x 8.0 (installation depth)
8	530-PA-CF-102 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3.2=6.4	2.5 x 1.5 x 8.0 (installation depth)
9	530-PA-CF-103 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3=6	2.5 x 1.5 x 8.0 (installation depth)
10	530-PA-CF-104 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3=6	2.5 x 1.5 x 8.0 (installation depth)
11	999-PA-RL-8131 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8

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S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Pump	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump (LXBXH) (m)
12	999-PA-RL-8132 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
13	999-PA-RL-8134 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
14	999-PA-RL-8135 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
15	999-PA-RL-8231 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
16	999-PA-RL-8232 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
17	999-PA-RL-8235 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
18	999-PA-RL-8237 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
19	999-PA-RL-8238 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
20	999-PA-RL-8239 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
21	510-PA-CF-003 A/B/C	**3**	Vertical Centrifugal Pump (OH6)	Electric Motor	3*2=6	2.5 x 1.5 x 2.5
22	500-PA-CF-010 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*4.0=8	3.2 x 2.5 x 3.0
23	500-PA-CF-011 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	3.0 x 2.5 x 3.0
24	500-PA-CF-015 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	2.4 x 2.2 x 3.0
25	500-PA-CF-024 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	3.0 x 2.5 x 3.0
26	500-PA-CF-025 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	2.5 x 2.4 x 3.0
27	510-PA-CF-001 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	2.0 x 1.8 x 3.0
28	510-PA-CF-002 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	2.0 x 1.8 x 3.0
29	510-PA-CF-004 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.7	2.0 x 1.8 x 3.0
30	410-PA-CF-101 A/B/C/D/E/F/G/H/I/J /K/L/M	**13**	Horizontal Centrifugal	Electric Motor	13*30=390	9.0x4.0x3.0
31	411-PA-CF-101 A/B/C/D/E/F/G/H/I	**9**	Horizontal Centrifugal	Electric Motor	9*30=270	9.0x4.0x9.0
32	410-PT-00-108	**1**	Horizontal Centrifugal	Turbine	1*10=10	6.0x4.0x3.0 & 4.5x3.5x3.0
33	410-PM-00-109	**1**	Horizontal Centrifugal	Electric Motor	1*6=6	4.5x2.5x2.0

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S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Pump	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump (LXBXH) (m)
34	411-PT-00-109	**1**	Horizontal Centrifugal	Turbine	1*10=10	6.0x4.0x3.0 & 4.5x3.5x3.0
35	411-PM-00-108	**1**	Horizontal Centrifugal	Electric Motor	1*6=6	4.5x2.5x2.0
36	401-PA-CF-23100 A/B/C/D	**4**	Vertical Centrifugal Pump (VS1)	Electric Motor	4*8.5=34	2.5 x 1.5 x 8.0 (installation depth)
37	999-PA-CF-8240 A/B/C/D	**4**	Vertical Centrifugal Pump (VS1)	Electric Motor	4*9=36	2.5 x 1.5 x 8.0 (installation depth)
38	441-PA-CF-101 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3.5=7	2.8 x 1.8 x 8.0 (installation depth)
Total Weight (Pumps)					**924.5 MT**	

A.2 SCHEDULE OF QUANTITIES (SOQ) FOR ALL TYPE OF COMPRESSOR PACKAGES WITH DRIVERS AND ACCESSORIES

(SOR Item No. 01RR.1.4.1 as per Doc # B957-999-80-42-PK-SOR-9501-A):

S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Equipment	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + auxiliaries etc.) (MT) (***Refer Note-1***)	Overall Dimensions skid (LXBXH) (m)
1	500-KA-RP-002 A/B	2	Horizontal Reciprocating Gas Compressor	Electric Motor	2*12	5.0x4.0x3.5 4.5x3.5x3.5(CWS) 3.5x2.5x2.5 (LOS)
2	500-KA-RP-003 A/B	2	Horizontal Reciprocating Gas Compressor	Electric Motor	2*12	5.0x4.0x3.5 4.5x3.5x3.5(CWS) 3.5x2.5x2.5 (LOS)
Total Weight					**48 MT**	

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A.3 SCHEDULE OF QUANTITIES (SOQ) FOR ALL TYPE OF ROTARY COMPRESSOR AND BLOWER PACKAGES WITH DRIVERS AND ACCESSORIES (SOR Item No. 01RR.1.7.4 as per Doc # B957-999-80-42-PK-SOR-9501-A):

S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Equipment	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump/skid (LXBXH) (m)
1	**530-LZ-00-101**	**1**	**LRVP**	**Electric Motor**	**1*50**	**15 x 13 x 7**
Total Weight					**50 MT**	

A.4 SCHEDULE OF QUANTITIES (SOQ) FOR INITIAL FILL OF LUBRICANTS, SEALING FLUID & OTHER CONSUMABLES ETC. REQUIRED FOR STARTUP AND COMMISSIONING (SOR Item No. 01RR.1.MG01 as per Doc # B957-999-80-42-PK-SOR-9501-A):

S. No.	Equipment Item Nos.	Overall Quantity (Lubricants, Sealing Fluids & Other Consumables) [Litres] (***Refer Note-2***)
1	**REFER TABLE A.1, A.2 & A.3 OF PART-A: UNIT (U&O) FOR LIST OF EQUIPMENTS**	**3150 L**

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PART-B: UNITS (U&O)

B.0 SCHEDULE OF QUANTITIES FOR ALL TYPE OF ROTATING EQUIPMENTS & MISCELLANEOUS ITEMS WITH DRIVERS AND ACCESSORIES

B.1 SCHEDULE OF QUANTITIES (SOQ) FOR ALL TYPE OF PUMPS WITH DRIVERS AND ACCESSORIES (SOR Item No. 01RR.1.1.1 as per Doc # B957-999-80-42-PK-SOR-9501-B)

S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Pump	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump (LXBXH) (m)
1	500-PA-CF-004 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*5=10	3.0 x 2.0 x 8.0 (installation depth)
2	500-PA-CF-006 A/B/C	**3**	Vertical Centrifugal Pump (VS6)	Electric Motor	3*8=24	2.8 x 1.8 x 8.0 (installation depth)
3	500-PA-CF-007 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*3.5=7	2.8 x 1.5 x 8.0 (installation depth)
4	500-PA-CF-009 A/B/C	**3**	Vertical Centrifugal Pump (VS6)	Electric Motor	3*3.2=6.4	2.8 x 1.5 x 8.0 (installation depth)
5	500-PA-CF-012 A/B	**2**	Vertical Centrifugal Pump (VS6)	Electric Motor	2*5=10	2.8 x 1.5 x 8.0 (installation depth)
6	500-PA-SM-008 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 6 (installation depth)
7	600-PA-CF-001 A/B/C	**3**	Horizontal Centrifugal Pump (OH2)	Electric Motor	3*8=16	3.8 x 2.6 x 3.0
8	402-P-1001 A	**1**	Vertical Centrifugal	Electric Motor	1*7.5	1.4x1.4x12
9	500-PA-SM-006 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 8 (installation depth)
10	500-PA-SM-007 A/B	**2**	Vertical Centrifugal Pump (VS1)	Electric Motor	2*3.2=6.4	Pump: 24" dia x 8 (installation depth)
11	510-PA-CF-006 A/B	**2**	Vertical Centrifugal Pump (OH6)	Electric Motor	2*2=4	2.5 x 1.5 x 2.5
12	500-PA-CF-016 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*4.0=8	3.2 x 2.5 x 3.0
13	500-PA-CF-017 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	3.2 x 2.5 x 3.0

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S. No.	Equipment Item No.	Quantity (Working / Standby)	Type of Pump	Type of Driver & Auxiliaries	No. of units x Total Weight (each eqpt. Incl. of eqpt. + driver + baseplate + cplg + seal plan etc.) (MT) (***Refer Note-1***)	Overall Dimensions Each pump (LXBXH) (m)
14	500-PA-CF-018 A/B	**2**	Horizontal Centrifugal Pump (OH2)	Electric Motor	2*3.2=6.4	2.4 x 2.2 x 3.0
15	500-PA-CF-019 A/B	**2**	Horizontal Centrifugal Pump (BB2)	Electric Motor	2*14=28	4.5 x 3.0 x 3.0
16	999-PA-RL-8133 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
17	999-PA-RL-8233 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
18	999-PA-RL-8234 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
19	999-PA-RL-8236 A/B	**2**	Rotary Lobe Type	Electric Motor	2*1.5=3	2.0 x 1.2 x 0.8
Total Weight (Pumps)					**164.9 MT**	

B.2 SCHEDULE OF QUANTITIES (SOQ) FOR INITIAL FILL OF LUBRICANTS, SEALING FLUID & OTHER CONSUMABLES ETC. REQUIRED FOR STARTUP AND COMMISSIONING (SOR Item No. 01RR.1.MF01 as per Doc # B957-999-80-42-PK-SOR-9501-B):

S. No.	Equipment Item Nos.	Overall Quantity (Lubricants, Sealing Fluids & Other Consumables) [Litres] (***Refer Note-2***)
1	**REFER TABLE B.1 OF PART-B: UNIT (U&O) FOR LIST OF EQUIPMENTS**	**1050 L**

NOTES:

1. Weights and dimensions indicated in SOQ are estimated only. Final weights and dimensions shall be as per General Arrangement drawing of vendor which shall be provided to contractor after award of the job.

2. A consolidated list for all free issue items shall be provided to Contractor indicating type of lubricant, grease, oil etc. giving specifications, quantities, brand name and their BPCL equivalent.

ANNEXURE – 2 (LIST OF ATTACHMENTS)

S. No.	Document Description	Document No.	Rev
1	Standard specification for documentation requirements from Contractors	6-78-0002	3
2	Standard Specification for erection of equipment & machinery	6-76-0001	4

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EQUIPMENT DETAILS FOR ERECTION

EPCM SERVICES FOR REFINERY FACILITIES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

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EQUIPMENT DETAILS FOR ERECTION

DEPT.: STATIC EQUIPMENT **JOB NO: B957**

S.NO	ITEM NO.	DESCRIPTION	QTY. (Nos.)	POSITION (See note 2)	SUPPORT TYPE	OUTSIDE DIA. (mm)	TL TO TL (mm)	OVERALL LENGTH (mm)	UNIT ERECTION WT. (Kg)	EL. FROM GRADE	REMARKS
VESSELS											
1.	500-VV-HI-001	AROMATIC BLOWDOWN DRUM-II (BDT TANKS & LOADING)	1	H	BRACKET	3044	7500	11450	26000	*	UNDERGROUND
2.	500-VV-HI-007	AROMATIC BLOWDOWN DRUM-III (BDT P/H)	1	H	BRACKET	3044	7500	11450	26000	*	UNDERGROUND
3.	500-VV-HI-008	OFFSPEC ETHYLENE BLOWDOWN CONDENSATE RECOVERY DRUM	1	H	BRACKET	3050	7500	11450	28000	*	UNDERGROUND
4.	510-TT-00-003 A/B	ISOPENTANE STORAGE BULLET	2	H	SADDLE	4680	34500	36900	210000		ABOVE GROUND

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EXCHANGERS

SL. NO.	ITEM NO.	DESCRIPTION	TEMA TYPE	STACKED YES/NO	QUANTITY OF SHELLS	MOUNTING	SHELL OD (MM)	~OVERALL LENGTH (MM)	~EMPTY WT PER SHELL(Kg) **	EL FROM GRADE	REMARKS
1.	500-EE-AT-004	OFFSPEC ETHYLENE BLOWDOWN SUPERHEATER	NKN	NO	1	H	1303/1803	6194	12000	*	

* As per equipment layout
@ Excluding weight of Internals

NOTES:

1. H - Horizontal; V – Vertical
2. Furnished erection weights are approximate weight of the equipment's.
3. Erection weight indicated are tentative. Final weight shall be as per approved vendor drawing.
4. Erection contractor shall carry out any other minor works, such as tack welding of washers above anchor chairs and any other work required to complete the job as per instructions of Engineer-in-Charge.
5. Installation of demisters, wire mesh screen, coalescer pads etc. in vessels/columns (supplied loose by others) wherever specified in REMARKS column shall be carried out as per instructions of Engineer-in-Charge.
6. For buried vessels, RCC Pit shall be filled with sand, packed with vibro-compression and 100mm lean concrete shall be provided on top as per instructions of Engineer-in-Charge.
7. Loading & procurement of sand shall be carried out as per instructions of Engineer-in-charge. The specification & quantity shall be as per Engineering Data sheet enclosed in the tender.

ABBREVATIONS

FIM – FREE ISSUE MATERIAL

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EQUIPMENT DETAILS FOR ERECTION

EPCM SERVICES FOR REFINERY FACILITIES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

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EQUIPMENT DETAILS FOR ERECTION

DEPT.: STATIC EQUIPMENT **JOB NO: B957**

S.NO	ITEM NO.	DESCRIPTION	QTY. (Nos.)	POSITION (See note 2)	SUPPORT TYPE	OUTSIDE DIA. (mm)	TL TO TL (mm)	OVERALL LENGTH (mm)	UNIT ERECTION WT. (Kg)	EL. FROM GRADE	REMARKS
VESSELS											
1.	441-VV-HW-101	INTERMEDIATE LP FLARE KOD	1	H	SADDLE	5052	15000	19150	71000	*	
2.	500-VV-VI-003	BUTENE-1 UNLOADING COMPRESSOR SUCTION KOD	1	V	PIPE LEG	1012	3200	6350	3500	*	
3.	500-VV-VI-004	PROPYLENE UNLOADING COMPRESSOR SUCTION KOD	1	V	PIPE LEG	1028	3400	6550	5100	*	
4.	500-VV-HI-004	COLD BLOWDOWN KOD (ETHYLENE VAPORISER PSV)	1	H	SADDLE	3040	10500	12400	30000	*	
5.	500-VV-HI-005	COLD CONDENSATE RECOVERY DRUM	1	H	BRACKET	3050	7500	11475	28000	*	UNDERGROUND
6.	500-VV-HI-006	AROMATIC BLOWDOWN DRUM-I(TF-20)	1	H	BRACKET	3044	7500	11475	26000	*	UNDERGROUND
7.	500-VV-HI-003	CLOSED BLOWDOWN VESSEL (PETCHEM GANTRY)	1	H	BRACKET	3044	7500	11475	26000	*	UNDERGROUND
8.	500-VV-HI-009	START UP ETHYLENE CONDENSATE RECOVERY DRUM	1	H	BRACKET	3050	7500	11475	28000	*	UNDERGROUND

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EXCHANGERS

SL. NO.	ITEM NO.	DESCRIPTION	TEMA TYPE	STACKED YES/NO	QUANTITY OF SHELLS	MOUNTING	SHELL OD (MM)	~OVERALL LENGTH (MM)	~EMPTY WT PER SHELL(Kg) **	EL FROM GRADE	REMARKS
1.	500-EE-AT-001	COLD BLOWDOWN VAPORIZER	NKN	NO	1	H	945/1149	7144	9500	*	
2.	500-EE-AT-002	COLD BLOWDOWN SUPERHEATER	NKN	NO	1	H	1622/2122	6094	15000	*	
3.	500-EE-AT-003	ETHYLENE START-UP HEATER	NKN	NO	1	H	551/936	3474	5000	*	

* As per equipment layout
@ Excluding weight of Internals

NOTES:

1. H - Horizontal; V – Vertical
2. Furnished erection weights are approximate weight of the equipment's.
3. Erection weight indicated are tentative. Final weight shall be as per approved vendor drawing.
4. Erection contractor shall carry out any other minor works, such as tack welding of washers above anchor chairs and any other work required to complete the job as per instructions of Engineer-in-Charge.
5. Installation of demisters, wire mesh screen, coalescer pads etc. in vessels/columns (supplied loose by others) wherever specified in REMARKS column shall be carried out as per instructions of Engineer-in-Charge.
6. For buried vessels, RCC Pit shall be filled with sand, packed with vibro-compression and 100mm lean concrete shall be provided on top as per instructions of Engineer-in-Charge.
7. Loading & procurement of sand shall be carried out as per instructions of Engineer-in-charge. The specification & quantity shall be as per Engineering Data sheet enclosed in the tender.

ABBREVATIONS

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EQUIPMENT DETAILS FOR INSULATION

EPCM SERVICES FOR REFINERY FACILITIES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

ENGINEERS INDIA LIMITED NEW DELHI	CLIENT: M/s BPCL PROJECT: BPREP						EQUIPMENT DETAILS FOR INSULATION	DOCUMENT NO.	REV
		0	24.02.2026	RNK	VIVEK	PB		B957-80-42-EP-9501B Page 1 of 2	0
		REV.	DATE	BY	CHK	APPD			

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EQUIPMENT DETAILS FOR INSULATION FOR HEAT EXCHANGERS

S.NO.	ITEM NO.	DESCRIPTION	NO. OF SHELL	Mounting (Note-2)	TYPE OF INSUL. (NOTE-3) (SHELL/ CHANNEL)	INSULATION THK. (mm)		TOTAL INSULATION AREA (m2) (FOR EACH ITEMS)				OPERATING TEMPERATURE (°C)	
								SHELL SIDE		CH. SIDE			
						SHELL SIDE	CH. SIDE	SH	HD	SH	HD	SHELL	CHANNEL
1.	500-EE-AT-004	OFFSPEC ETHYLENE BLOWDOWN SUPERHEATER	1	H	IH/IC	65	IC (Cold Personal protection) 140mm PIR +50mm cellular glass.	25	-	-	10	143.2/143.1	-102/5

LEGEND (H) – HOLD

Vendor designed item details will be given later on Insulation area furnished is tentative.

NOTES:

1. For elevation of equipment from grade, refer to equipment layout enclosed elsewhere in the tender document.
2. H - Horizontal; V – Vertical.
3. IH- Hot Insulation; IS - Personnel Protection; IC - Cold Insulation
4. ALSO REFER RESPECTIVE MDS / SETTING PLAN ATTACHED ELSEWHERE IN THIS TENDER.

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EQUIPMENT DETAILS FOR INSULATION

EPCM SERVICES FOR REFINERY FACILITIES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

ENGINEERS INDIA LIMITED NEW DELHI	CLIENT: M/s BPCL PROJECT: BPREP						EQUIPMENT DETAILS FOR INSULATION	DOCUMENT NO.	REV
		0	24.02.2026	RNK	VIVEK	PB		B957-80-42-EI-9501A Page 1 of 3	0
		REV.	DATE	BY	CHK	APPD			

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EQUIPMENT DETAILS FOR INSULATION FOR VESSELS

DEPT.: STATIC EQUIPMENT **JOB NO.: B933**

S.NO.	ITEM NO.	DESCRIPTION	QTY. (Nos.)	OUT SIDE DIA. (mm)	LENGTH TL TO TL (mm)	SUPPORT TYPE	POSITION (See note 2)	DESIGN TEMP. °C	TYPE OF INSULATION (See note 3)	INSUL. THK. (mm)	TOTAL INSULATION AREA (M2) (FOR EACH ITEM)				REMARKS
											HOT		COLD		
											SHELL	HEAD	SHELL	HEAD	
1.	500-VV-HI-004	COLD BLOWDOWN KNOCK OUT DRUM	1	3040	10500	SADDLE	H	(-)110/65	IC	190	-	-	115	15	140mm PIR +50mm cellular glass

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DEPT.: STATIC EQUIPMENT **JOB NO.: B957**

EQUIPMENT DETAILS FOR INSULATION FOR HEAT EXCHANGERS

S.NO.	ITEM NO.	DESCRIPTION	NO. OF SHELL	Mounting (Note-2)	TYPE OF INSUL. (NOTE-3) (SHELL/ CHANNEL)	INSULATION THK. (mm)		TOTAL INSULATION AREA (m2) (FOR EACH ITEMS)				OPERATING TEMPERATURE (°C)	
								SHELL SIDE		CH. SIDE			
						SHELL SIDE	CH. SIDE	SH	HD	SH	HD	SHELL	CHANNEL
1.	500-EE-AT-001	COLD BLOWDOWN VAPORIZER	1	H	IH/IC	65	140 PIR +50 cellular glass	40	-	10	-	143.2/143.1	-85.63/-67.23
2.	500-EE-AT-002	COLD BLOWDOWN SUPERHEATER	1	H	IH/IC	65	140 PIR +50 cellular glass	35	-	5	-	143.2/143.1	-84.6/5
3.	500-EE-AT-003	ETHYLENE START-UP HEATER	1	H	IH/IC	65	225	10	-	5	-	143.2/143	-98/-35

LEGEND (H) – HOLD

Vendor designed item details will be given later on Insulation area furnished is tentative.

NOTES:

1. For elevation of equipment from grade, refer to equipment layout enclosed elsewhere in the tender document.
2. H - Horizontal; V – Vertical.
3. IH- Hot Insulation; IS - Personnel Protection; IC - Cold Insulation
4. ALSO REFER RESPECTIVE MDS / SETTING PLAN ATTACHED ELSEWHERE IN THIS TENDER.

SCOPE OF WORK
(ELECTRICAL)
FOR
U&O COMPOSITE TENDER

PROJECT : **OVERALL PROJECT MANAGEMENT AS MPMC AND PMC /EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP**

OWNER : **M/s BHARAT PETROLEUM CORPORATION LIMITED**

UNITs : **U&O**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	17.03.2025	ISSED FOR TENDER	SK	RSR	RSR

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1.0 SCOPE OF WORK / SUPPLY

Scope of work shall include supply (wherever specified), inspection, installation, testing and commissioning of electrical power distribution system comprising of various electrical equipment, lighting system, earthing and lightning protection system, cabling system and other miscellaneous works.

The tender scope broadly comprises of electrical works in the following areas but not limited to these of BPREP Project (Offsites and Utilities).

Part A: (ECU, PP, LLDPE, CT-01, CT-02, TF-20, TF-21, Flare, RWPS, RWTP+RODM+ZLD, Petchem gantry, SS-108, SS-109, SS-106, existing substation SS-16 etc.)

a. EHV (66kV) 1core, cable & associated intertrip and differential FO cable laying between new MRS (SS-100) to SS-101, SS-102, SS-103, SS-105, SS-106, SS-109, SS-110.

b. HV (6.6kV) 1core/3 core, cable & associated intertrip and differential FO cable laying between new MRS (SS-100) to SS-108.

c. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-106 to CT-01, CWPH, CWTP, TF-21, workshop extension.

d. HV (6.6 KV) 3 core / 1 core cable, MV (415 V) cable & associated control cable laying between SS-108 to Polymer warehouse, Petchem gantry.

e. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-109 to CT-02, CWPH, CWTP.

f. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-110 to RWPS, Flare, TF-20, Gate house, catalyst warehouse, ware house, chemical storage, satellite fire station etc.

g. Complete Cable tray work on main / branch pipe rack & pipe sleepers and cable trenches from above substations (SS-106, 108, 109, 110) to respective offsites loads to be fed within PART-A battery limit as defined elsewhere.

h. Electrical Works in SS-106, SS-108, SS-109, CR-04, satellite fire station, offsite pump houses with PART-A battery limit including earthing & lightning protection, lighting, cabling etc.

Part B: (MRS-100, TF-22, TF-23, TF-24, TF-26, N2 plant, STG block, SS-112, SS-107, DG, SS-05A, Petchem MCR, Lab, Site office, SS-111, CPU, Polymer Gatehouse, driver rest room)

a. HV (6.6KV) 1 core/3 core power cable & associated intertrip and differential FO cable laying between new MRS (SS-100) to SS-111, SS-112, SS-05A, SS-109.

b. HV (33 KV), Single core cable & associated intertrip and differential FO cable laying between existing SS-10A in existing Bina refinery complex to new substation SS-107 for critical/most essential power supply.

c. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-109 to TF-22, TF-23, TF-24, TF-26, Nitrogen (N2) plant, SS-107, SS-112 etc.

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d. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-5A to FWPH-Extn., Petchem MCR, Lab, Site office.

e. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between SS-111 to CPU, Polymer gate house, driver rest room.

f. HV (6.6 KV) 3 core / 1 core, cable & & associated intertrip and differential FO cable laying between SS-107 to MRS-100, SS-101, SS-102, SS-103, SS-105, SS-106, SS-108, SS-109, SS-110, SS-111, SS-05A, SS-112 for emergency power distribution.

g. HV (6.6 KV) 3 core / 1 core, MV (415 V) cable & associated control cable laying between BDT SS to TF-13, TF-14, pump house, Naphtha unloading, Gantry, existing control room building etc.

h. Complete Cable tray work on Main / branch pipe rack, pipe sleepers & cable trench from feeding substations above to respective loads for all facilities in PART-B battery limit + BDT area as defined elsewhere.

i. Electrical works for SS-107, DG building, SS-5A, offsite facilities, new facilities in BDT area etc. including earthing & lightning protection, lighting, cabling etc.

j. Modification/extension of switchboards in existing substation (SS-16), to accommodate new feeders, relays, metering units, communication modules, cable terminations, and associated interface work.

k. Alteration, relocation, or replacement of existing cables, trays, supports, lighting fixtures, junction boxes, earthing strips, and associated accessories.

Contractor (for Part A and Part B) shall also provide electrical services in the respective areas/ buildings/units/offsites which are specifically not mentioned above, however required for the installation/ commissioning and satisfactory operation of facilities covered under subject Project.

Contractor scope includes meeting all the requirements defined in specifications, datasheets and drawings attached with the tender and required for completion of the job including but not limited to the areas defined above. The scope shall also include handling, transportation of equipment/ material from Purchaser's stores/ warehouse to the place of installation and supply of mandatory and commissioning spares wherever required.

This document shall be read in conjunction with attached Job Specification and Schedule of Rates (SOR).

Bidder may visit Site prior to bidding to familiarize themselves with site and to ascertain the nature of work involved with prior permission of EIL/Owner.

1.1 SUPPLY, INSTALLATION, TESTING AND COMMISSIONING (EQUIPMENT/ MATERIAL SUPPLIED BY CONTRACTOR):

Contractor shall supply all items/ equipment required for completion of the work except those specifically mentioned under Cl. No. 1.4 below. The quantities as indicated in SOR document no. B957-999-16-50-PK-SOR-9501-A & B957-999-16-50-PK-SOR-9501-B are tentative and actual required quantities shall be bought as per site requirement in consultation with Engineer-

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in-Charge. The equipment/ material in Contractor's scope shall include but not be limited to the following:

1.1.1 Supply, filtration and filling of transformer oil for Purchaser's supplied transformers as required.

1.1.2 Supply, installation, testing and commissioning of dry type transformers.

1.1.3 Industrial, weather proof type Push Button (Break glass type) stations in transformer bay for tripping remote breaker

1.1.4 Supply of commissioning spares and special tools and tackles as required for supplied equipment.

1.1.5 Indoor draw out type 6.6kV, HV extension /modification in breaker Panel in existing substation buildings as per scope defined in tender

1.1.6 For 6.6kV Extension panel one set of "Tripping Coil (1 No.), Closing coil (1 No.), control fuse /MCB (10 nos. of each rating and type), Auxiliary relays (1 no. of each type)" for each extension breaker panel shall be considered as mandatory spares for 6.6kV Extension breaker panel. **Price of mandatory spare for 6.6kV Extension breaker panel shall be inclusive in respective SOR items (PART-A & B)**.

1.1.7 Mandatory spares for 415V vacant feeders shall be considered as per mandatory spares list attached with electrical design basis B857-999-16-50-EDB-1001 Rev-01 attached with tender. **Price of mandatory spare for vacant feeders shall be inclusive in respective SOR (PART-A & B).**

1.1.8 415V/ 415V Dry Type Lighting Transformers.

1.1.9 415V fixed type PDB.

1.1.10 415V Flameproof MOVDB.

1.1.11 415V weatherproof fixed type feeder pillar.

1.1.12 MCB box for battery rooms.

1.1.13 Electrical Heat Tracing system as per scope of work & job specification (doc. no. B957-999-16-50-SP-9503) enclosed with tender .

1.1.14 30M smart high flood light mast for safe and hazardous area.

1.1.15 Feeder in vacant compartment and /or extension of panels in existing HV (6.6kV) & MV (415) Switchboards.

1.1.16 WP/FLP local control stations suitable for safe area/ hazardous area.

1.1.17 Flameproof (IIA/IIB) and weatherproof junction boxes.

1.1.18 Flameproof (IIA/IIB) and weatherproof socket and plug.

1.1.19 **Floor mounted standalone marshaling panels** for E&I interface cables

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1.1.20 Canopies for equipment, as required.

1.1.21 Flameproof (IIA/IIB) and safe area lighting fixtures

1.1.22 Lighting poles for Safe Area and Hazardous Areas.

1.1.23 Lighting Panel/Power Panel, MCB Box, Fans and Exhaust Fans

1.1.24 Clamps for platform and ceiling mounted lighting fixtures

1.1.25 Heat Shrinkable type 33kV & 6.6 kV Unearthed grade HV termination kits and straight through joints.

1.1.26 415 MV power and control cables.

1.1.27 Optic Fibre cable (OFC) along with FR HDPE duct for feeder differential protection relays.

1.1.28 Earthing system including Cu bonded high tensile low carbon steel core earth electrodes in maintenance free chemical test pits, earthing grid, earth plates, earthing conductors / strips of various sizes & associated connectors and accessories etc.

1.1.29 Grounding system including GI earth electrodes in test pits, earthing pits employing deep bore well electrodes (up to 60 mtr), earthing grid, wire ropes, earth plate, earthing cables /strips of various sizes, flexible connections, lightning protection rods, associated connectors and accessories etc.

1.1.30 Supports for push button stations, etc. including painting and all materials.

1.1.31 Supply and making of MV straight through joints.

1.1.32 Supply and making of straight through joints for communication, FA and paired cables.

1.1.33 Cable trenches including excavation, backfilling, compacting, spreading of sand including all supplies and accessories.

1.1.34 Prefabricated G.I. cable trays ladder type, slotted channel type cable trays of various sizes along with horizontal & vertical bends, Tee including providing its supports and related civil works and tray fittings for GI pre-fabricated type cable trays.

1.1.35 G.I. sheet covers for cable trays.

1.1.36 Cable markers/ earth pit markers, identification tags, GI saddles, saddle bars and associated accessories inclusive of providing and fixing supports.

1.1.37 GI pipes and PVC pipes for cable protection above ground, floor sleeves and supports etc., wherever necessary.

1.1.38 Supply, fabrication and erection of MS frames, structural steel, Cable racks in trenches, cable tray supports, anchor fasteners, GI canopies, brackets for miscellaneous electrical equipment including welding, bolting etc. and necessary supplies and connected works all-inclusive of painting as specified.

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1.1.39 Supply, fabrication and erection of bolted and/or welded Structural Steel Works of all types using "COLD FORMED SQUARE HOLLOW SECTIONS" conforming to IS: 4923, Grade Yst-355 of approved make as defined in structural part of SOR.

1.1.40 Concealed and surface mounted GI/ black enameled steel, PVC conduits

1.1.41 Weatherproof and Flameproof Nickel-plated double compression brass cable glands, crimping type, long barrel, circular/sector shaped, type aluminium/ bimetallic/ tinned copper lugs and Nickel-plated brass blocking plugs for unused entries as required.

1.1.42 Nickel plated single compression brass cable glands, crimping type, long barrel, circular/sector shaped, type aluminium/ bimetallic/ tinned copper lugs and Nickel-plated brass blocking plugs for unused entries as required.

1.1.43 Safety equipment/ fire extinguishers, safety mat, epoxy based, insulation coating, sand bucket, First Aid Box, rubber hand gloves, gas masks, face shield, electrical protection suit, HV tester & HV tapes, Enameled caution boards, discharge rods, etc.

1.1.44 Chequered plates for covering floor cutouts, unused cable trenches etc.

1.1.45 All other hardware like nuts, bolts, washers, spring washers, grouting bolts etc. necessary for completion of job. All hardware shall be of stainless steel (SS 304).

1.1.46 Gravel as required in transformer bays etc.

1.1.47 Miscellaneous material like sand / stone dust, bricks / clay bricks, plain cement concrete etc. for civil works.

1.1.48 Cable trenches including excavation, backfilling, compacting, providing of brick protection by second class bricks/fly ash bricks including all supplies and accessories. Supply & laying of sand/fly ash in Cable trenches including providing of brick protection by second class brick/ fly ash bricks including all supplies and accessories.

1.1.49 Sealing compound

1.1.50 Safety equipment's

1.1.51 Illuminated framed Electrical Single Line Diagrams for Sub-stations

1.1.52 Epoxy based insulating paint (for Sub Station switchgear floors)

1.1.53 Fire proof sealing system

1.1.54 Trefoil clamps for single core cables.

1.1.55 Canvas Tarpaulin of 18 m x 18 m size for Monsoon and Dust protection of electrical panels is included in contactor's scope. Same shall be provided by contractor as and when required to protect the electrical equipment from rain / dust. No separate payment shall be done for the same.

1.1.56 Bracing of single core 66kV, 33kV & 6.6kV cables laid in trefoil formation shall be done by suitable clamps at intervals not exceeding 2 m along the cable routing. In addition to these clamps, single core cables shall be bound with tapes in line with IS. Price quoted against

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laying of cables shall include the price for supply and installation of bracing clamps and binding tapes and no separate price for bracing/ binding as specified above shall be considered for payment.

1.1.57 **Smart lighting control network**:
Design, engineering, supply, installation including laying of FO cables, testing & commissioning of smart lighting control network for all existing and new smart high mast & smart street lighting including supply of fiber optic cables & HDPE ducts of required length, LIU kits, ethernet switches, termination accessories, centralized control system comprising of HMI-PC, interface with upstream ECS system and downstream interface with smart lighting system (i.e. 30 mtr high mast, street light pole and hybrid solar street lighting poles) and all necessary hardware, software etc. as per approved drawings, specifications of this tender and directions of Engineer-in-charge.

1.1.58 Smart feeder pillar with feeder controller for controlling street light poles and hybrid solar street light poles.

1.1.59 Modification of existing conventional safe area and hazardous area high masts to convert into smart high mast.

1.1.60 AC Hi-pot/HV testing of insulation (as per IEC-60840) for 66kV cables.

1.1.61 Any other material (not covered under EIL/ Purchaser's supply at clause 1.2) and though not specifically mentioned above but required for completion of the work as per specifications, drawings and instruction of Engineer-in-Charge.

Note: Quantities given in SOR are tentative. Contractor shall take EIL Site In-charge's approval before ordering. In no case contractor shall order any quantity without prior approval.

1.2 INSTALLATION, TESTING AND COMMISSIONING (EQUIPMENT/ MATERIAL SUPPLIED BY PURCHASER)

1.2.1 66kV & 33kV GIS Isolating breaker panels through respective OEM's.

1.2.2 Busducts of various ratings between transformer secondary and switchgear.

1.2.3 Gas ducts for 6.6kV switchgear.

1.2.4 Installation, testing and commissioning of switch-boards, relay and control panels, annunciation panels, UPS system, battery chargers, distribution boards, cubicles with electrical equipment, VSD panels, misc. electrical panels etc.

1.2.5 Installation, testing and commissioning of miscellaneous surface mounted industrial/FLP control gear such as lighting/power panel, push button stations, motor starter, communication equipment, junction boxes, panels, plugs, sockets.

1.2.6 Installation of stationary nickel-cadmium battery banks.

1.2.7 Supply of plugs, sockets and junction boxes- weatherproof metal clad 415V, TPN, industrial type socket and plug with heavy duty interlocking switch, with adequately sized cable adaptor box for incoming and outgoing cable terminations, including supply of double compression brass nickel plated cable glands, tinned copper lugs.

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1.2.8 66/6.9 kV ONAN/ONAF outdoor power transformers with online tap changer panels excluding foundation.

1.2.9 6.6/ 0.433 kV ONAN outdoor Distribution Transformers with off circuit tap changer, excluding foundation.

1.2.10 6.6 kV MV switchboards & isolation breaker panels with VCB.

1.2.11 Draw out type 415V LV Switchboards (PMC's/ EPMC's/ PMCC's/ MCC's/ ASB's/ LDB's/ ELDB's).

1.2.12 6.6kV Capacitor Banks.

1.2.13 LV (415 V) bus ducts including all supports.

1.2.14 Flameproof lighting/power panels.

1.2.15 Flame proof receptacles, plugs & sockets.

1.2.16 Installation of Substation automation relay LAN, Master Ethernet Racks and associated equipment of SAS (excluding testing and commissioning).

1.2.17 Installation 230V AC UPS systems including battery banks, battery chargers and ACDBs etc. (excluding testing and commissioning).

1.2.18 Installation 110V AC UPS systems including battery banks, battery chargers and ACDBs etc. (excluding testing and commissioning).

1.2.19 Installation 110V DC systems including battery banks, battery chargers, BMS and DCDBs etc. (excluding testing and commissioning).

1.2.20 Connection, testing, no load running and commissioning of 6.6 kV, 3 Ph Squirrel cage induction/synchronous motors (including all items and accessories).

1.2.21 Connection, testing, no load running and commissioning of 415V, 3 phase & 240V, single phase squirrel cage induction motors.

1.2.22 Connection, testing and commissioning of 415V, 3 phase & 240V, single phase auxiliary heaters.

1.2.23 Connection, testing, no load running and commissioning of Motor operated valve actuators.

1.2.24 Laying, termination, straight through jointing, testing & commissioning of 66kV (E) grade Cu. Conductor, corrugated aluminum sheathed, single core, XLPE insulated, armoured and FRLS PVC outer sheathed cables (To be laid in readymade concrete lined trenches, buried trenches, road crossings, pipes and on above ground GI cable trays on offsite pipe racks & substations, including supply and fixing of trefoil clamp for single core cables, in substation and offsite area etc.). Contractor to note that the 66kV cabling work shall be carried out by cable OEM only. Details of OEM shall be informed during detail engineering.

1.2.25 Laying, termination, straight through jointing, testing & commissioning of 33kV (E) grade, Al. conductor, single core, XLPE insulated, armoured and FRLS PVC outer sheathed cables (To be laid in readymade concrete lined trenches, buried trenches, road crossings, pipes

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and on above ground GI cable trays on offsite pipe racks & substations, including supply and fixing of trefoil clamp for single core cables, in substation and offsite area etc.). Contractor to note that the 33 KV cabling work shall be carried out by specialized agency having PTR (past Track Record) for laying, termination testing & commissioning of 33kV (E) or above cable. Contractor to submit PTR for approval of Owner/EIL.

1.2.26 Laying, termination, straight through jointing, testing & commissioning of 6.6 kV (UE) grade, Cu./ Al. conductor, multi core, XLPE insulated, FRLS, armoured cables (To be laid in readymade concrete lined trenches, buried trenches, road crossings, pipes and on above ground GI cable trays on offsite pipe racks & sleepers, substation, in substations, unit and offsite area, etc).

1.2.27 Laying, termination, testing & commissioning of medium voltage 1100V, XLPE insulated, FRLS type, armoured power and twisted pair control cables to be laid in readymade concrete lined trenches, modular cable duct, buried trenches, road crossings, pipes and on above ground cable tray in substation, control room, unit and offsite area, pipe racks/sleeper etc.

1.2.28 Laying termination, testing & commissioning of optical fibre (OFC) cable with HDPE duct for feeder differential protection.

1.2.29 FLP control stations and FLP MOV distribution boards (MOV DB).

1.2.30 FLP equipment like lighting fixtures, lighting and power panels, junction boxes, lighting poles, plugs, welding receptacles, sockets etc. including all lighting for Tech structure including complete platform lighting including all light fixtures, lighting panels, circuit wiring, cabling etc. as required.

1.2.31 F.A system equipment like Fire Alarm Panel, MCPs, detectors, Exit Signage, hooters etc.

1.2.32 Plant Communication system equipment's like loudspeakers, field call stations, desktop operator call stations, amplifiers, acoustic hoods, beacon lamps etc.

1.2.33 NIFPS system equipments including laying and termination of cables, pipe fitting's, valves, flanges etc.

1.2.34 Any other material and though not specifically mentioned above but required for completion of the work as per specifications, drawings and instructions of Engineer-in-Charge.

1.3 MISCELLANEOUS

1.3.1 The job includes repairing of all civil works damaged during installation of electrical facilities and civil works connected with grouting of equipment, providing foundations for control stations, lighting poles, earth pits etc. Scope of work under this contract shall be inclusive of breaking of walls/ floors and chipping of concrete foundations necessary for the installation of equipment, materials and making good of the same. Scope shall also include removal & reinstallation of False Flooring Panels (with suitable modification, as required) after installation of electrical equipment.

1.3.2 The work shall be carried out in best workmanship-like manner, in conformity with these specifications, approved drawings and the instructions, from time to time, of the owner or Engineer-in-Charge.

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1.3.3 Laying of cables in existing trenches to be done in some part of plant area. Contractor to take all precautions to safety of existing cables. No cables should be damaged. If any cable gets damaged during process then these are to be repaired at contractor cost by heat shrink sleeve/straight through joint/replacement as per extent of damage and site conditions. All above repairs/replacement cost are to be borne by contractor and immediate action to be taken by contractor. Decision of EIL/Owner is binding on contractor for repairs.

1.3.4 The scope of contract shall include clearing of temporary constructions, waste materials and loose earth, which might get collected in and nearby the work site during execution of work and after final completion.

1.3.5 Coordination between various agencies/ equipment vendor/ other contractors working at site and providing all assistance and interface connections as per drawings to enable others to take up testing and commissioning activities of their equipment/ systems.

1.3.6 Rerouting of existing underground cables/earth strips fouling in way of other contractor's excavation. The charges will be paid as per SOR rates equivalent to new work.

1.3.7 Cable end termination and straight through joints to be executed through trained cable jointer having 10 years plus experience in cable jointing work. The jointer should be hired/ deputed from Manufacturer Company of which make approved jointing/ termination materials are supplied.

1.3.8 6.6 KV grade cables should be tested for VLF test and sheath integrity test.

1.3.9 LV cables sheath integrity test to carried out by contractor and if any found the cable sheath is damaged then the damage is to be repaired for waterproof repairs. No separate cost for these repairs will be paid.

1.3.10 Supply and installation of all other accessories not specifically mentioned herein but nevertheless necessary for completion of job.

1.3.11 Engineering and preparation of specifications and drawings for electrical equipment and installation wherever applicable/ required by Purchaser and submitting the same to Purchaser for approval/ comments.

1.3.12 Correction and submission of all Purchasers' drawings to AS-BUILT status. The same is deemed to be included in the rates quoted for the respective items. No separate SOR item has been considered for the same.

1.3.13 Obtaining clearance and approvals for installation/drawings from Central Electricity Authority/ Chief Electrical inspectorate/ Chief Controller of Explosives PESO/ (CCoE), any other statutory authority for energizing the complete electrical facilities covered under this tender and obtaining PESO/ (CCoE) approval for items/package for installation and use in the hazardous classified area in which they are located. No separate payment shall be made to contractor for obtaining these approvals.

1.3.14 Contractor should deploy the engineers/technicians and skilled work force having relevant work expertise in electrical construction work. The technical staff should have required statutory technical certification and experience required for the job execution. If EIL/Owner finds the quality issue of work quality/ technical knowledge of any deputed technical staff the same staff is to be replaced by contractor with competent technical person.

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1.3.15 Contractor should comply the statutory provisions of Chief Electrical Inspector office / MP state statutory authorities for electrical job execution and required permissions and fulfilling the requirement of Electrical engineer and technicians and their qualifications.

1.3.16 Minor modifications, wherever needed, for the free-issued material/ equipment/ devices to enable cable entry/ termination, wiring changes etc.

1.3.17 Sealing of openings made in walls/ floors, firewalls for cables etc., using acceptable practices and standards.

1.3.18 Fire resistant paint shall be provided as per OISD recommendation for all terminations (up to 1 m) from cable gland at switchgear end. Fire resistant paint shall also be provided at the load end terminations (up to 1 m) for motors / DBs / JBs /Receptacles etc. Cables, before and after upto a length of 2m from the GI kick pipe entry in process area & pump houses shall be provided with fire proof coating as per IEC -60331.

1.3.19 Modification works in 33kV & 6.6kV HV switchboards, 415V MV switchboards, located in Existing Substation buildings.

1.3.20 6.6 kV HV termination kits and straight through jointing kits shall be Heat shrinkable type.

1.3.21 HV and MV cable terminations SOR items are inclusive of testing & commissioning of cables & terminations and no separate payment is admissible towards testing & commissioning of cables.

1.3.22 Letter painting and marking with radium stickers on indoor/outdoor electrical equipment such as switchboards, panels, local control stations, motors, light fittings etc.

1.3.23 Removal and reinstallation of false ceiling in Buildings (Sub Stations/Control Rooms) as per site requirement for installation of MS/PVC conduits for above false ceiling. No separate payment shall be made for removal and reinstallation of false ceiling.

1.3.24 Removal and reinstallation of cover slabs of RCC trench for laying of cables. No separate payment shall be made for removal and reinstallation of RCC trench cover slabs.

1.3.25 Vendor specific miscellaneous accessories like clamps etc. required for cable trays shall be supplied by Contractor as part of respective SOR Item. No separate payment shall be made for same.

1.3.26 After the job completion, contractor shall update the `ISSUED FOR CONSTRUCTION' drawings to 'AS-BUILT' status. Final certified 'AS- BUILT' drawings shall be submitted by the contractor to owner in both hard and soft copies.

1.3.27 Preparation of cable drum schedules for HV, MV Power & Control cables to minimise cable wastage.

1.3.28 Terminal strip identification tag and terminal number identification tags shall be provided for interface box, marshalling panel, junction box, local control station etc.

Note: Wherever separate SOR items do not cover above activities, these shall be deemed

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to be included in contractor's scope without any extra price and cost implication.

1.4 WORKS EXCLUDED

Works listed herein are specifically excluded from the scope of this contract:

1.4.1 Supply of equipment/ material as listed under Cl. 1.2 above

1.4.2 Testing and commissioning of Substation Automation system including, HMI & relay metering LAN for EHV (66kV), HV (33kV & 6.6 KV) and MV (415 V) Systems.

1.4.3 Testing and commissioning of DC system including battery banks, battery chargers. BMS and DCDBs.

1.4.4 Testing and commissioning of UPS system including battery banks, battery chargers, BMS and ACDBs.

1.5 SPECIFIC REQUIREMENTS

1.5.1 It is noted that the Electrical Heat Tracing (EHT) system shall be included as a Lump Sum item under the composite tender scope. However, to cater for any addition or deletion during execution, the Contractor shall provide unit rates for associated supply, installation, testing, and commissioning activities. These unit rates shall be incorporated through a dedicated Annexure to the Schedule of Rates (SOR) and shall be applicable for any approved variations.

1.5.2 The Danger Boards shall have Skull–Bone & Voltage Level indication in English & Hindi Languages (White coloured letters on red background), with minimum dimensions of 250 mm X 250 mm.

1.5.3 As per CEA Guidelines (Regulations–16 for Safety), all electrical panels shall be provided with warning notice "Disconnect / Isolate power supply before opening panel covers" on the removable covers on live bus-bar sections.

1.5.4 Regarding working at height / cable tray fixing / cable laying at height, the following points shall be taken care of:

(a) All items in the Schedule of Rates shall be inclusive of all constructional infrastructures like scaffolding / staging, including material and workmen to put such facilities in place.

1.5.5 All lighting panels, power panels and welding receptacles shall be provided with 4pole incoming.

1.5.6 Control cable shall be twisted pair individual and overall shielded type.

1.5.7 For obtaining approval of completed installations from the Central Electricity Authority (CEA) / Chief Electrical inspectorate, no separate payments shall be made for obtaining the CEA approvals (in parts or complete).

1.5.8 RCCB shall be provided at each outgoing of the LP/PP.

1.5.9 Fire proofing paint for cables complying to IEC-60331 with 90 minutes fire rating. Type test certificates for the same shall be furnished by Bidder before order placement.

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1.5.10 The doors for all interface boxes / marshalling panels/ boxes shall be with hinged doors and shall have padlock provision facility.

1.5.11 Rotation of terminal box of HT & LT motor by 90/180 degree wherever required including all labor, material etc. shall be considered in contractor's scope. No separate payment shall be done for the same.

1.5.12 To and Fro shifting of motors from site (from all elevations) to location inside petchem complex/existing refinery designated by engineer in-charge. Bidder to ensure that motors can be shifted from site to electrical shop for overhauling during commissioning stage. No separate payment shall be done for the same.

1.5.13 SOR Item no. 01EE.1100.10: Anchor fasteners used for Base frame of Switchgear, Cable tray support in Cable cellar etc. shall not be payable in this item".

1.5.14 Termination of 6.6kV cable through Elastimold Kit shall be done by certified Elastimold jointer only.

1.5.15 Mobilization of Scaffolding for carrying out site work at elevations such as installation of Lighting fixtures, tray supports & tray installation works etc. is included in contractor's scope. No safety violation in this regard shall be accepted. No separate payment shall be done for the same.

1.5.16 Heat Run test shall be conducted on each rating of Lighting Transformer. Bidder to note that no additional payment shall be made on account of this and prices of the same shall be included by bidder in the respective SOR item.

1.5.17 Earth pit number shall be marked and painted on each earth pit. Earth pits shall be painted as per standard i.e., earth pit for equipment earthing, body earthing etc. shall be of green colour, earth pit for transformer neutral earthing shall be of black colour, earth pit for lightning protection shall be of blue colour.

1.5.18 Cable tags shall be printed stainless steel metal tags / non-magnetic non-corrosive metal tags and nylon rope shall be used as cable tie.

1.5.19 High Pot testing of HT cables and equipment shall be performed after terminations / jointing in line with requirements specified in EIL standard spec. 6-51-0087.

1.5.20 Make of fuses shall be finalized as per make of fuse provided in free issued switchboards. Accordingly, the makes shall be finalized by contractor after obtaining approval from Engineer-in-Charge.

1.5.21 All push button stations shall be provided with 2 nos. earthing lugs / studs.

1.5.22 Testing and commissioning of safe area/ FLP Motor Operated valve (MOV) actuators shall be done by bidder through MOV Actuator OEM Engineer. Bidder to quote accordingly.

1.5.23 DC high voltage test shall be conducted as per Cl. 3.13.1 of EIL spec. 6-51-0087 on all HV feeders' cables and also on 1100V grade cables where straight through joints have been made.

1.5.24 Lighting installation shall be tested for correct illumination levels, with fittings installed. Final LUX level study shall be carried out after completion of project activities by Contractor before handing over to Client.

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1.5.25 Contractor shall submit vendor drawings of those material, equipment, items for which supply is included in contractor's scope of supply (such as dry type lighting distribution transformer, 6.6kV extension panels, 415 V feeder modifications, Space heater PDB, marshalling panels, power and control cables, High mast Lighting system, all hazardous area equipment etc.) and only after approval of EIL/BPCL, the material/item/equipment shall be considered before ordering/manufacturing. However, it is to be understood that the review of drawings shall not absolve the basic responsibility of Contractor to check total compliance to specifications included in tender document.

1.5.26 Cable lugs shall be crimping type of following material. All the cable lugs shall be long barrel type. Lugs having sector shaped/ circular barrel shall be used for making connections for cables having sector shaped/ circular geometry of conductor respectively. Lugs shall be as per the following:

a) Aluminium conductor cable termination on Aluminium bus bar/ terminals in switchboards - Aluminium lugs
b) Aluminium conductor cable termination on copper bus bar/ terminals in switchboards - Bimetallic lugs having Al barrel & tinned Cu palm
c) Copper conductor cable termination on Aluminium bus bar in switchboards – Bimetallic lugs having tinned Cu barrel and Al palm
d) Copper conductor cable termination on copper bus bar/ terminals in switchboards- Tinned copper lugs

Owner's MV cables shall be Copper/Aluminium cables and all owner's control cables shall be Copper cables.

1.6 CO-ORDINATION WITH OTHER CONTRACTORS/ AGENCIES

It is the responsibility of the contractor to coordinate and provide all necessary assistance to other contractors/ agencies/ vendors involved in the complex for proper and timely execution of the works.

1.7 STATUTORY APPROVAL OF WORKS

1.7.1 Contractor shall make an application on behalf of the Purchaser for submission to CEA/ Electrical Inspectorate along with copies of required certificates complete in all respects and submit to the Engineer-in-Charge for onward transmission well ahead of time so that the actual commissioning of system/ equipment is not delayed for want of inspection by the Inspector. Contractor shall arrange the actual inspection of work by the Electrical Inspector. Necessary coordination and liaison work in this respect shall be the responsibility of the contractor. For PESO/ CCoE approval of imported items, Contractor shall interact with PESO/ CCoE, as required, and obtain their approval for use of the equipment in hazardous areas, as applicable, based on certificates from authorities of countries of origin as supplied by respective equipment manufacturer. Contractor shall carry out all related activities as per directions of Engineer-in-Charge.

1.7.2 The Inspection and acceptance of work as above shall not absolve the Contractor from any of his responsibilities under this contract.

1.7.3 Any other statutory approval of works required for the electrical installation (such as OISD, PESO/CCoE, etc.) is also included in contractor's scope.

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SPECIAL INSTRUCTIONS TO VENDOR
(INSTRUMENTATION)

PROJECT : **EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BINA PETCHEM & REFINERY EXPANSION PROJECT, BPREP**

OWNER : **M/s BHARAT PETROLEUM CORPORATION LIMITED**

UNIT : **UTILITIES AND OFFSITES**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	17.03.2026	ISSUED FOR TENDER	AS	JJ	AR

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1.1 BPCL Bina Refinery located at Bina, Madhya Pradesh is setting a new world scale Ethylene Cracker and Associated Units and Ethylene and Propylene based Petrochemical units for its diversification to Petrochemicals along with expansion of its existing refinery capacity to about 11 MMTPA. As a part of the Petrochemical project, it is proposed to install following facilities. The units/blocks under this Petrochemical Block are as follows:

Unit	Capacity	Licensor
Ethylene Cracker Unit (ECU) & Auxiliary Unit (AU)	1200 KTPA	Lummus
Polypropylene Unit	550 KTPA	Grace
LLDPE/HDPE Swing	2x 575 KTPA	Univation
Butene-1	50 KTPA	Axens
OFFSITE FACILITIES (Engineered by EIL)		
Tank Farms (Tanks, Bullets, Spheres, DWST) **TF-20** (RPG, BTX UNIT FEED, OFFSPEC BENZENE, TOLUENE, C9-180, HEXENE-1 & HEXANE) :- 10 Nos. **TF-21** ETHYLENE DWST:- 2 Nos. **TF-22** OFF SPEC ETHYLENE & RAW C4 MIX/OFFSPEC BUTENE-1:- 2 Nos. **TF-23** ISO PENTANE:- 2 Nos. **TF-24** PROPYLENE & OFF SPEC PROPYLENE:- 6 Nos. **TF-26** BUTENE-1:- 2 Nos. **BDT Area TF** BTX & PFO Storage :- 9 Nos.		
BDT (Bina Dispatch Terminal Augmentation)		
Petchem Loading Gantry		
UTILITY SYSTEMS (Engineered by EIL)		
Steam Generation Package		
Compressed Air and Cryogenic Nitrogen Plant		
Cooling Towers (CT-1 & CT-2)		
RWTP, RODM & ZLDP		
Flare System		
FGRS (Flare Gas Recovery System)		
Raw Water Pumping System		
ETP		
Polymer Warehouse		
Fire Water Pumping System Augmentation		

1.2 This tender covers the Instrumentation works involved in the following units in two parts:

PART A (WEST SIDE) :

- Flare System
- FGRS
- Refrigerated Ethylene Storage tank (DWST) TF21 package
- TF-20
- Raw Water Pumping System
- Cooling Towers (CT-1 & CT-2)
- RWTP, RODM & ZLDP

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- Petchem Loading Gantry
- Polymer Warehouse

PART B (EAST SIDE+ BDT) :

- TF-22, 23, 24, 26
- Steam Generation Package
- Compressed Air and Cryogenic Nitrogen Plant
- ETP
- Bina Dispatch Terminal Augmentation

1.3 Electrical Codes : As per IS/ IEC

Area Classification of Field for Tank Farms, BDT (Bina Dispatch Terminal Augmentation), Petchem Loading Gantry, Steam Generation Package, Cooling Towers (CT-1 & CT-2), ETP, Flare System, FGRS (Flare Gas Recovery System): Zone 2 Gas Gr. IIA/IIB, T3

Area classification of Field for Fire water pump house, Compressed Air and Cryogenic Nitrogen Plant, RWTP, RODM & ZLDP, Raw Water Pumping System, Polymer Warehouse : Safe Area

The various Control Rooms (CR) and Satellite Rack rooms (SRRs) associated with as part of the tender are as follows :-

Room	Grouping of units	Location	
		Non-hazardous Area	Hazardous Area
PETCHEM MCR	Operation and Monitoring of following units: ➢ ECU, AU & CT-01 ➢ LLDPE/HDPE Swing & CT-02 ➢ Butene-1 & Tankages TF#20, TF#21,TF#22,TF#23,TF#24,TF#26 ➢ Polypropylene Unit, Flare, FGRS	✓	
SRR-101	ECU & CT-01	✓	
SRR-102	ECU AU	✓	
SRR-103	LLDPE/HDPE Swing & CT-02	✓	
SRR-104	Butene-1 & Tankages TF#22,TF#23,TF#24,TF#26	✓	
SRR-105	Polypropylene Unit, Flare, FGRS & Tankages TF#20, TF#21	✓	
CR-01	Operation and monitoring of Compressed Air and Cryogenic Nitrogen Plant	✓	

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CR-02	Operation and monitoring of RWTP, RODM & ZLDP and Raw Water Pumping System	✓	
CR-03	Operation and monitoring of ETP	✓	
CR-04	Operation and monitoring of Petchem Loading Gantry	✓	
Existing CPP Control Room	Operation and monitoring of Steam Generation Package	✓	
UB-2 SRR	Steam Generation Package	✓	
Existing BDT Control Room	Operation and monitoring of Bina Dispatch Terminal Augmentation	✓	
Existing SRR#7	Fire Water Pumping System Augmentation.	✓	
Polymer Warehouse	Operation and monitoring of Bagging and Palletizing Machines	✓	
New Admin Building	For Locating DCS Backup Storage Server and extending F&G & CCTV Consoles.	✓	

The type of power supplies being used in these units is 110 V AC UPS, 110 V DC, 24 V DC, 240 V AC Non-UPS.

1.4 The units covered in this tender (as mentioned above) comprise of the following major packages:

S. No.	Package	Package Vendor	Mode of Execution
	PART A		
1.	FLARE PACKAGE	To be ordered	LSTK (#)
2.	FLARE GAS RECOVERY PACKAGE (FGRS)	To be ordered	$
3.	COOLING TOWER-1 & 2	M/s IWCL	LSTK (#)
4.	REFRIGERATED ETHYLENE STORAGE TANK PACKAGE (DWST) TF-21	M/s VTV	LSTK (#)
5.	RWTP, RODM & ZLDP	M/s VA Tech Wabag	LSTK
6.	ETP	To be ordered	LSTK
7.	POLYMER WAREHOUSE	To be ordered	$
8.	PETCHEM LOADING GANTRY UNLOADING COMPRESSORS	To be ordered	$
	PART B		
1.	COMPRESSED AIR AND CRYOGENIC NITROGEN PLANT	M/s Linde	LSTK
2.	STEAM GENERATION PACKAGE	M/s BHEL	LSTK

$:- Supply by Vendor and Site erection by Instrumentation MEI Contractor.

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:- Laying of all cables from package battery limit to respective SRRs by MEI Contractor.

The Control systems considered for the above Units / Systems are as below:

A) Ethylene Cracker Unit (ECU) & Auxiliary Unit (AU), Polypropylene Unit, LLDPE/HDPE Swing, Butene-1, Tank Farms TF-20/21/22/23/24/26, Flare System & FGRS (Flare Gas Recovery System)

Control System for all these Units and its packages shall be in DCS and PLC supplied by Main Plant DCS / PLC Vendor located in the respective SRRs for monitoring and controlling from Petchem MCR.

B) Compressed Air and Cryogenic Nitrogen Plant

Control System of this system / package shall be in package vendor supplied DCS / PLC based control system supplied by Package Vendor for monitoring and controlling in CR-01 with an OFC connectivity to Petchem MCR for data exchange.

C) RWTP, RODM & ZLDP

Control System of this system / package shall be in package vendor supplied DCS / PLC based control system supplied by Package Vendor for monitoring and controlling in CR-02 with an OFC connectivity to Petchem MCR for data exchange.

D) ETP

Control System of this system / package shall be in package vendor supplied DCS / PLC based control system supplied by Package Vendor for monitoring and controlling in CR-03 with an OFC connectivity to Petchem MCR for data exchange.

E) Petchem Loading Gantry

Control System of this loading gantry along with unloading compressors shall be in Terminal Automation System (TAS) along with PLC based control system supplied by TAS Vendor for monitoring and controlling in CR-04 with an OFC connectivity to Petchem MCR for data exchange and TAS console extended to BDT Control Room.

F) Bina Dispatch Terminal Augmentation

BDT Augmentation shall be implemented in existing Terminal Automation System (TAS) along with DCS and PLC based control system supplied by existing TAS Vendor (M/s. Honeywell Automation India Ltd) for monitoring and controlling in existing BDT Control Room.

G) Steam Generation Package

Control System for Steam generation Package shall be implemented in DCS and PLC supplied by package Vendor located in the UB-2 SRR for monitoring and controlling from existing CPP Control Room.

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H) Bagging & Palletizing Machine

Control System for Bagging & Palletizing Machines located in Polymer Warehouse shall be implemented in PLC based control system supplied by package Vendor located in the Polymer Warehouse for machines local operation with an OFC connectivity to SRR#104 & SRR#105 for data exchange with Main Plant DCS.

1.5 This document shall be read in conjunction with Standard specifications for erection tender (6-52-0060), specifications, standards, drawings and other documents attached with this tender. The same forming a part of the Tender document consists of Instrumentation works related to above Process units catering to existing refinery revamp at BPCL Bina, Madhya Pradesh.

1.6 This tender comprises of the following SOR document comprising of Instrumentation works of the respective Parts as tabulated below:

Sl. No.	SOR Doc. No.	Part
1	B957-999-69-41-PK-T-9501-A	Part A
2	B957-999-69-41-PK-T-9501-B	Part B

Contractor's scope of work shall include complete Instrument installation and supply with details as listed under "Schedule of rates for Instrumentation Works, scope of work detailed in Standard specification for erection tender 6-52-0060, this document and other standard specifications, & drawings enclosed.
Contractor scope of supply shall also include supply of instrument items specifically listed in the "Schedule of rates" with specifications attached elsewhere in the tender document. Contractor shall refer to the engineering drawings issued for construction at the time of Site work for ascertaining the quantity of each supply item listed in the SORs to be procured by them and finalize the quantity accordingly before procurement with the approval of the Purchaser. The supply items shall be procured from the Project enlisted vendors listed in this document.

Contractor shall understand the requirement of this tender in totality, including various implications of the content of all documents of this tender, before the SOR is filled and quoted.

The instrumentation works shall include, as a minimum:

a) Cable laying also includes laying of cables between junction boxes within package vendor Battery limit/ LCP in the package vendor Battery limit and Petchem Main Control Room (MCR)/ SRR/ other CRs, Cable laying between Petchem Main Control Room (MCR)/ SRR / other CRs and field, cable laying wherever required from package vendor supplied instruments & their junction boxes/LCPs.

b) Instrument installation also includes package vendor supplied loose instruments with or without hook-up materials as per the instruction of engineering–in-charge.

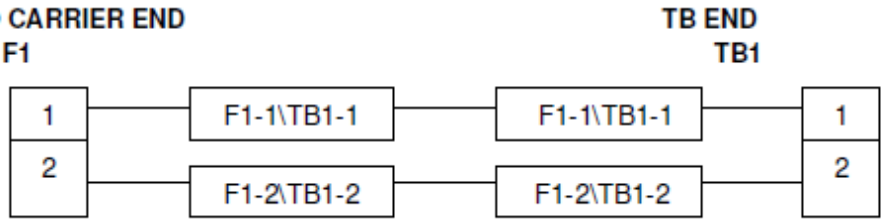
1.7 The Contractor shall be responsible for complete activities including activities of all sub-contractors under him for the complete instrument works as part of his scope.

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1.8 The ferruling philosophy/type shall be cross ferruling as detailed below for the cable termination at DCS / PLC based control system end. Silicon sleeve shall be used for cross ferruling.

Ferrules used shall be single sleeve with source destination type.

Example:



Ferruling scope at DCS/ PLC end shall be by Purchaser's DCS/ PLC vendor and at field / Package LCP end by Contractor.

1.9 **Cable duct**

a) Contractor scope shall include the supply, fabrication and erection of instrument cable ducts and its accessories in the main pipe rack, as listed under schedule of rates attached elsewhere in the tender document and as per the drawing (7-52-0254 for GI) attached. Instrument Contractor's scope shall also include removal of duct cover as and when required during Site work execution. Cost of the same shall be considered in the erection of the duct accordingly.

b) Ducts shall be fabricated type as per the drawing (7-52-0254 for GI) and shall be laid as per the overall duct layout drawing B957-999-16-51-00801 & B957-999-16-51-00812 attached with the tender. All the accessories like tee, bends shall be provided as required.

c) Cable duct shall be fabricated out of GI sheets as per 7-52-0254. Bolts & Nuts for ducts shall be of SS material.

d) Contractor's scope shall also include the rectification of defects occurred to ducts caused during cable laying as per SOR (Item No 01II.610).

1.10 **Cable tray**

a) All cables on the main sleeper shall be laid in cable duct. All branch cables shall be run on cable trays. The cable trays shall be made of Hot Dip galvanized MS sheets.
b) Each individual cable routed through trays must be clamped or tied using SS wires. The overall clamping shall be with aluminium clamp instead of tying with cable armour. Nuts/Bolts for cable tray fixing shall be SS.
c) Contractor shall select the vendor of ducts/trays based on the Proven Track Record of six months after installation in commissioned Hydrocarbon Project. (Proven ness considered from the last day of the last month of the Tender Bid due date).

1.11 **Instrument Air Line Installation:**

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a) Instrumentation airline pipe & pipe fittings shall be of SS material up to Instrument Air distribution manifold. Material of Tube shall be SS 316L and Tube fittings shall be SS 316.

b) The instrument air supply to individual users shall be as per typical hook-ups drawing 7-52-1904 & 7-52-1905 attached elsewhere in the tender document. Contractor shall lay 1" instrument air line from the header upto the Instrument Air distribution manifold (6/12 way) and further distribution shall be carried out using ½" or ¼" instrument air supply tubing to individual instrument, by Contractor, as per the requirement.

c) Typically, 5 mtrs. of SS tube laying shall be considered in the quoted rates for each control valve tubing hook-up SOR clause..

d) Contractor shall note that the Instrument Air distribution manifold shall be brought close to the individual users and installed in such a way that further distribution of individual ½" or ¼" piping/tubing length shall be maintained at minimum from the end user. A typical airline distribution shall be prepared by contractor at site and shall be submitted to Engineer-In-charge for review/ approval before proceeding with fabrication & erection.

e) Instrument Airline piping/ tubing for valves shall be properly routed in perforated trays in such a way that the operation of the valve, opening of the valve shall not face any hindrance. All Instrument Air distribution manifold shall be tagged. Also contractor shall provide SS tag plate at pneumatic ball valves at Instrument Air distribution manifold end & and at end user for cross identifying both sides for maintenance.

1.12 Contractor shall note the following

a) Loop checking of Temperature transmitter shall include loop checking from the respective RTD/Thermocouple.

b) Installation mentioned in the SOR for the no. of transmitters shall be based on the installation standard mentioned against each type.

1.13 Contractor's scope shall include laying, dressing, tagging, ferruling, glanding, pair / core identification & termination of all field cables in the field instruments/ junction boxes. Refer Annexure-1 for general scope demarcation for site activities between Control System Vendor and Contractor. This shall also be read in conjunction with the SOR and Standard specifications for erection tender (6-52-0060).

1.14 The fieldwork shall be carried out under strict safety regulations and work permits as laid down by the client. The Contractor shall take extreme care in ensuring the safety and all safety gear like helmets, belts, safety shoes etc., for the Contractor's personnel.

1.15 Painting colour of yoke will be intimated during execution.

1.16 **Junction boxes & Cable glands / adaptors**

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a) Contractor's scope shall include the supply of various junction boxes and cable glands / adaptors as per the quantity indicated in SOR meeting Standard specifications 6-52-0048 attached with tender from the vendor list as given below:

1) BALIGA LIGHTING EQUIPMENTS (P) LIMITED
2) SUDHIR SWITCHGEARS PVT LTD
3) KAYSONS TECHNO EQUIPMENTS PVT. LTD.
4) FCG HI-TECH PRIVATE LIMITED
5) PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED
6) FCG POWER INDUSTRIES PVT LTD
7) PHOENIX MECANO INDIA PVT. LTD.
8) FLAMEPROOF EQUIPMENTS PVT.LTD
9) FLEXPRO ELECTRICALS PVT LTD
10) R STAHL PVT LTD

b) All junction boxes shall be weatherproof to IP 65 for intrinsic safe instruments and weatherproof to IP 65 & flameproof Ex'd' to area classification for flame proof instruments as specified in the attached Instrumentation SOR as per as per IS/IEC 60079.

c) Following shall be considered for the junction boxes for the termination of multipair signal cables:

- No. of terminals inside junction boxes: - 48 Nos.
- No. of cable entries for multipair cables: - 2 Nos. of 1 ½" NPT with 1 entry plugged.
- No. of cable entries for single pair cables: - 12 Nos. of 1/2" NPT.
- Color of Junction boxes: - Blue for intrinsic safe instruments & Grey for flameproof/ Exd instruments. The same will be firmed up during junction box drawing review.
- Junction boxes shall have bottom entry for single pair as well as multipair cables.
- Price for the cable glands & plugs shall not be considered in the price of junction boxes since separate SOR items have already been considered for the supply of cable glands and plugs.

d) The junction box terminal block mounting rail, hinges, screw and handle shall be of minimum Stainless Steel material.

e) Actual Tag No for junction boxes will be furnished during junction box drawing review for indicating on the JB name plate.

f) Further to Sl. No. 2.2.5 of Standard specification for Junction boxes and cable glands (6-52-0048) attached with tender, exact cable dimensions shall be verified by Contractor based on the cable dimensions at site for the design of cable glands. Adapters if required to suit to the Purchasers exact cable dimensions shall be in Contractor's scope. No implication on account of supply of cable glands suiting to actual cable dimension is allowed.

g) All cable glands shall be of SS 304 and they shall be of double compression type suitable for armoured cables. Slipper type PVC sleeves (cable shrouds) shall be supplied by contractor over cable glands for all cable entries in junction boxes. Cost of the PVC sleeves shall be considered in the price of the junction boxes.

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h) All cable glands shall be flameproof Ex'd' (both JB and Instrument side) irrespective of the area classification.
i) All signal JB's shall be with hinged type cover.
j) Junction Box Terminals shall be 'push-fit clamp on type' with side cable termination.
k) Junction boxes shall be of Bolted design with SS bolts.

1.17 Tube & Tube fittings

a) Contractor's scope shall include the supply SS316L & Copper tube and various SS316 & brass fittings as per the quantity indicated in SOR meeting Standard specifications 6-52-0068 & 6-52-0067 attached with tender from the vendor list as given below:

Vendor list for Tube Fitting (Non HC Service)

1. PRECISION ENGINEERING INDUSTRIES
2. ARCELLOR CONTROLS INDIA
3. SEALEXCEL (INDIA) PVT. LTD.
4. MULTIMETAL INDUSTRIES
5. ARYA CRAFTS & ENGINEERING PVT LTD
6. ASTEC VALVES & FITTINGS PVT. LTD.
7. COMFIT & VALVES PVT. LTD.
8. TRUEWAY ENGINEERING INDUSTRIES
9. PRECISION ENGINEERING INDUSTRIES
10. ASTEC VALVES & FITTINGS PVT. LTD
11. FITOK INCORPORATED
12. SWAGELOK COMPANY
13. EXCELSIOR ENGG. WORKS
14. EXCEL HYDRO PNEUMATICS PVT LTD
15. WESMEC ENGINEERING PRIVATE LIMITED
16. PRIME ENGINEERS
17. HAM-LET (ISRAEL-CANADA) LTD.
18. PARKER HANNIFIN CORPORATION
19. SSP FITTINGS CORPORATION
20. TK FUJIKIN CORPORATION
21. APTEK INSTRUMENTATION PVT LTD
22. HAVI ENGINEERING INDIA PVT LTD
23. MET-LOK VALVES AND FITTINGS
24. FLUID CONTROLS PVT LTD
25. PANAM ENGINEERS LIMITED
26. HP VALVES & FITTINGS INDIA PRIVATE LTD
27. SHREEMARUTI INSTRUMENTS PVT LIMITED
28. MET-LOK VALVES AND FITTINGS
29. DK-LOK CORPORATION
30. TUBEFIT ENGINEERS
31. VENTIL FLOWSERVE PRIVATE LIMITED
32. SHARP ENGINEERING
33. CRANE INSTRUMENTATION & SAMPLING PFT CORP.
34. SWASTIK ENGINEERING WORKS

Vendor list for Instrument Tubing (Non HC Service)

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1. RATNAMANI METALS AND TUBES LTD
2. TK FUJIKIN CORPORATION
3. SHUBHLAXMI METALS AND TUBES PVT. LTD
4. REMI EDELSTAHL TUBULARS LTD (FORM RMIL)
5. SURAJ LIMITED
6. KRYSTAL GLOBAL ENGINEERING LIMITED
7. MAXIM TUBES COMPANY PVT LTD
8. TUBACEX TUBES AND PIPES PRIVATE LIMITED
9. HEAVY METAL & TUBES (INDIA) PRIVATE LTD
10. JINDAL SAW LTD (KOSI WORKS)
11. DK-LOK CORPORATION

b) Contractor shall ensure that SS316L tubes offered by them shall have molybdenum content of minimum 2.5%.

c) All SS316 fittings shall be flare less double compression type.

d) Copper tubes covered in the SOR shall be BARE type.

e) Contractor shall also follow Inspection & Test Plan (ITP) for 6-81-2067 & 6-81-2068 Inspection and test plan for instrument tubing and instrument tube fittings attached with tender.

f) Tube and tube fittings and Instrument Valves shall be supplied from the vendor list mentioned above. However, Contractor to note that tube and tube fittings and Instrument Valves for the hydrocarbon service as mentioned in Item Nos. 01II.550.70.3V2, 01II.550.50.1V75, 01II.550.50.1V76, 01II.550.50.4V12 in B957-999-69-41-PK-T-9501-B shall be supplied from the Project vendor list as given below ONLY:

	SS TUBES (HC SERVICES)	
Sl No.	Supplier Name	Country
1	SANDVIK ASIA PVT. LTD.	INDIA
2	BOMBAY FLUID SYSTEM COMPONENTS (P) (SWAGELOK Make)	INDIA
3	SUPER TECHNICAL(INDIA) PVT LTD. (PARKER Make)	INDIA
	TUBE FITTINGS (HC SERVICES) & SS ISOLATION VALVE HC SERVICE	
Sl No.	Supplier Name	Country
1	BOMBAY FLUID SYSTEM COMPONENTS (P) (SWAGELOK Make)	INDIA
2	SUPER TECHNICAL(INDIA) PVT LTD. (PARKER Make)	INDIA

1.18 **Instrument Air ball valves**

a) Contractor's scope shall include the supply of ½" Instrument air SS316 ball vales as per Standard Specifications for Instrument Valves and Manifolds (6-52-0069) enclosed with tender from the vendor list as given below:

Vendor list for Instrument Valves and Manifolds (Non HC Service)

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1. SHREEMARUTI INSTRUMENTS PVT LIMITED (INDIA)
2. EXCEL HYDRO PNEUMATICS PVT LTD (INDIA)
3. COMFIT & VALVES PVT. LTD. (INDIA)
4. BAUMER TECHNOLOGIES INDIA PVT.LTD (INDIA)
5. ASTEC VALVES & FITTINGS PVT. LTD. (INDIA)
6. ARYA CRAFTS & ENGINEERING PVT LTD (INDIA)
7. FLUID CONTROLS PVT LTD (INDIA)
8. SWASTIK ENGINEERING WORKS (INDIA)
9. CHEMTROLS INDUSTRIES PVT. LTD. (INDIA)
10. PANAM ENGINEERS LIMITED (INDIA)
11. HAVI ENGINEERING INDIA PVT LTD (INDIA)
12. HP VALVES & FITTINGS INDIA PRIVATE LTD (INDIA)
13. MET-LOK VALVES AND FITTINGS (INDIA)
14. HAM-LET (ISRAEL-CANADA) LTD. (ISRAEL)
15. PRIME ENGINEERS (INDIA)
16. PARKER HANNIFIN CORPORATION (UNITED STATES)
17. TK FUJIKIN CORPORATION (KOREA)
18. ANDERSON GREENWOOD CROSBY (UNITED STATES)
19. CRANE INSTRUMENTATION & SAMPLING, INC. (UNITED STATES)
20. METAVAL ENGINEERING PRIVATE LIMITED (INDIA)
21. EXCELSIOR ENGG. WORKS (INDIA)
22. WIKA PROCESS SOLUTIONS INDIA PRIVATE LIMITED (INDIA)
23. MET-LOK VALVES AND FITTINGS (INDIA)
24. SWAGELOK LIMITED (UNITED KINGDOM)
25. SWAGELOK COMPANY (UNITED STATES)
26. ASTEC VALVES & FITTINGS PVT. LTD. (INDIA)
27. WESMEC ENGINEERING PRIVATE LIMITED (INDIA)
28. PRECISION ENGINEERING INDUSTRIES (INDIA)

1.19 Cable entry into the Control rooms shall be through Multi Cable Transit (MCT) blocks. MCT frames/blocks shall be supplied by Purchaser (through control system vendor) and MCT frames shall be installed by Contractor. Refer Annexure-1 for general scope demarcation for site activities between Control System Vendor and Contractor.

1.20 Contractor's scope shall include installation of ISMC for Junction box installation, wherever any column/structure not available. This includes providing anchor/ fasteners/ welding of base plate etc. Refer SOR Item No. 01II.600.11 regarding installation of junction boxes on free standing support including supply, fabrication and installation of supports along with required ISMC channel and accessories and as per instructions of Site In-charge. Refer to Std. drgs. 7-52-0104 & 7-52-0106 attached with the tender.

1.21 The Contractor shall order 50% of perforated trays, angle trays, ducts, junction boxes, glands and Canopies required as per the schedule of rates immediately on placing of order. Rest shall be ordered as per the actual site requirements and AFC drawings but within the project time frame for that activity.

1.22 Contractor's scope shall include the PMI (Positive material Identification) test for all the pipe and fittings of instrument impulse line hook-ups of Alloy steel (AS) and stainless steel (SS) material. The cost of the above is deemed to be included by the Contractor in the rate quoted for all impulse line installations in Stainless steel (SS) and Alloy steel (AS).

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1.23 Contractor's scope shall include making holes in the RCC for fixing up of supports for instrumentation items, trays, JB frames etc.

1.24 For installation of instruments on Pre-fabricated hookups, Contractor's scope shall include erection of supports on the main pipeline wherever required, as per the respective installation standards and as per the instruction of Engineering-in-charge. Field transmitter supports should be properly clamped to the pipe for pre-fabricated wherever required and closed couple installation. No air gap shall be kept between support clamp and pipe.

1.25 Location and flow direction of on-line instruments including Orifice Plates, Control valves and On-Off Valves, Mass Flow Meters, etc. shall be checked by the Contractor. Contractor shall also check & report to the Engineer-in-Charge for advising the Piping erection team for the correct orientation of pressure taps of orifice flanges prior to welding of the first isolation valves In case of any discrepancy, the same shall be reported to the Engineer-in-Charge immediately for rectification.

1.26 The drawings for canopies enclosed with tender are with FRP construction and same shall be considered for transmitters & JB. Prefabricated FRP canopy for transmitters shall cover top and all 3 sides. Canopy for JB shall cover 3 SIDES. Canopy thickness shall be 3mm minimum. FRP canopy shall have Acrylic window & mounting bracket plate material shall be SS304. Color of the canopy shall be Light grey. Tag number shall be painted on the canopy. Glass content mentioned in 7-52-0105 shall be read as 30%.

1.27 Canopy for junction boxes in shutdown service the background color of tagging shall be red and a further label shall be fitted stating "This box contains trip circuits".

1.28 Canopy for junction boxes in intrinsically safe junction boxes the background color shall be blue and a further label shall be fitted stating "This box contains I.S. circuits".

1.29 Canopy for DP type flow / pressure instruments shall be designed by the contractor properly coordinating the actual installation requirements and ensuring that the valve manifold is kept outside the canopy for operation without removing the canopy for both normal and prefabricated hookups. Contractor shall ensure 1 sample canopy of each application are brought to site and coordinated with exact installation prior to giving the manufacturing clearance for the canopies.

1.30 Typical characteristics of FRP canopy shall be following:

a) High mechanical strength
b) Weather resistant (Resistant to most of the acids, alkalies vapors & fumes).
c) UV resistant
d) Anti-Static
e) Special rubber grommets for Cable/ Tube entry.

1.31 Contractor to select vendor based on their proven track record of installation in Hydrocarbon Projects. Contractor shall submit all the canopy drawings to Purchaser for approval.

1.32 Contractor shall follow Piping material specification attached elsewhere with the tender and its requirements like welding, testing, NDT etc.

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1.33 Documentation shall be provided as per the Doc. No. 6-78-0002 “Specification for documentation requirements from Contractors”.

1.34 Contractor shall follow the Doc. No. 6-78-0001 “Specification for quality management system requirements from bidders”.

1.35 Contractor shall ensure adequate monsoon protection while carrying out instrumentation work stipulated under the Contract.

1.36 Contractor shall follow Inspection & Test Plan (ITP) for Instrumentation work 6-82-3400. However, for instrument loop checking Annexure-1 & 2 of Standard specification for erection tender (6-52-0060) shall be followed.

1.37 For Optical fiber cable laying, Contractor shall consider all associated activities for cable splicing, light testing etc. For cable laying in HDPE conduit, Contractor shall consider all the required equipments like blowing machine, compressor etc., rate for the same deemed to be included in the respective SOR item.

1.38 For installation of miscellaneous items as per SOR (Item No 01II.450), bidder shall not consider supply & installation of Yoke support for items like Air filter Regulators/ Boosters/ Quick Exhaust Valve/ Air Lock Relays, Volume bottles and accessories like Volume boosters, Quick exhaust relay etc. However, required tubing works for the installation of the same will be in Contractor’s scope.

1.39 Cable Drum schedule shall be provided with approximate lengths. However, Contractor shall measure the actual length and shall cut the cable with the approval of Engineering-in-charge. Cable drums maybe be provided with RFID tags containing cable drum details information. The contractor shall coordinate with the Engineer-in charge during cable drum allotment for updating the same in the Site Cable drum allocation system.

1.40 Contractor shall carryout painting as per painting specifications attached elsewhere with the tender.

1.41 Refer to Standard specification for erection tender (6-52-0060): Project specification attached with the tender shall be referred for the ‘’6-44-0016’’ wherever mentioned in 6-52-0060.

1.42 Refer to Cl. No. 3.1.6.33 & 4.14 of Standard specification for erection tender (6-52-0060) fire proofing of cable duct and trays are not applicable for this Project.

1.43 Refer to 3.2.2 of Standard specification for erection tender (6-52-0060). Installation of line mounted instruments like Control valves, On-Off Valves, Coriolis Mass Flow Meters, Ultrasonic Flow Meter, Magnetic Flow Meters, Vortex Flow Meter, Variable Area Flow Meters, Venturi Flow Meter, Integral Orifice Flow Meter, Pressure Safety Valves, Self Actuated Pressure Control Valves, etc. shall be in Contractor’s scope as per SOR Item No. 01II.950.

1.44 Refer to 3.2.7 of Standard specification for erection tender (6-52-0060). Painting of impulse lines shall be in Contractor’s scope as per SOR Item No. 01II.950.13.

1.45 Refer to Instrumentation SOR item 01II.500.20: Price for Loop checking from DCS/PLC system shall not be considered as separate price for the same has been considered under SOR item 01II.510.

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1.46 All the Instrumentation drawings attached with the tender are only for reference. Latest revision of drawings shall be provided to after award of contract as part of site erection.

1.47 The installation hookup drawings attached with the tender may vary. Exact installation hookup drawings shall be provided to after award of contract as part of site erection. Contractor shall note that for the instrument installation of any new installation standard over and above that referred in the tender, contractor shall execute the installation work based on the rates for the similar installation standard attached with the tender. Similarly, shall be the case for the various testing requirements like PWHT & Radiography also.

1.48 All items supplied by Contractor shall be inspected at respective manufacturer works as per the inspection test plans attached elsewhere with the tender.

1.49 Further to Cl No. 4.8.12 of Doc. No. 6-52-0060, all multipair cables shall have identification tag with JB no. at every 50-meter interval even in duct.

1.50 Contractor's scope shall also include communication systems like walky / talky or flameproof mobiles required for field activities like loop checking etc for field coordination.

1.51 Contractor's scope shall also include the preparation of witness calibration certificate after the calibration of various PSV/TSV. Contractor to note that each safety relief valve shall be subjected to a seat leakage test in accordance with API standard 527 and acceptance criteria shall be zero leak (no bubbles). The test medium shall be air or N2, irrespective of service fluid mentioned in data sheet. Valves should be with zero leak at 90 % of the set pressure.

1.52 MOC of earthing wire for SOR items under Nos. 01II.650 shall be copper instead of GI wires. The JBs carrying 110 V AC/ DC signals shall also be body earthed to the plant power earthing system. However, the power earthing of the 24 V DC signal JBs is not required.

Annexure-1

Scope demarcation for site activities between Control System Vendor and MEI Contractor:

S. no.	*Activity*	*Control System Vendor Scope*	*MEI Contractor Scope*
1.	Installation of MCT frames & blocks including the installation of insert blocks, stay plates, dummy blocks etc.	No	Yes
2.	Cable laying till MCT frame	No	Yes
3.	Cable laying from MCT (including pulling through MCT frames and fixing the insert blocks) to cabinets in existing / new control room / Rack Room including free issue (package cabinets).	No	Yes

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4.	Multipair cable continuity checking and meggering from existing control room to field	No	Yes
5.	Tagging, glanding, ferruling and termination of cables in cabinets in existing control room including free issue (package cabinets) & including supply of glands.	Yes	No
6.	Shifting of control system vendor panels from Purchasers Warehouse to existing / new control room / rack room.	Yes	No
7.	Shifting of Package Vendor supplied panels / cabinet from Purchasers Warehouse to existing / new control room / rack room.	No	Yes
8.	Installation of control system vendor panels in existing / new control room / rack room.	Yes	No
9.	Coordination with control system Vendor for estimating the exact cable distance from field to cabinet and also smooth handover of cables at respective panel.	Yes	Yes

The scope demarcation as mentioned above is for Contractor's general information. However, any activity required to be carried out by the Contractor at the field shall be executed by Contractor based on the SOR rates. However, for CR-01, CR-02, CR-03 and UB2-SRR all activities shall be carried out by the respective LSTK contractor.

Cables mentioned above pertains all types of cable i.e. Serial, OFC, Multipair, Power, as applicable.

As a general philosophy, since Petchem MCR is located in Part B Area, all interconnecting OFC cables from various SRR's / CR (irrespective of the location of SRR / CR in Part A / Part B area) to Petchem MCR shall be in the scope of Part B contractor scope.

Part B contractors' scope shall include laying of OFC cable from Petchem MCR to BDT Control Room and also to New Admin Building. Also, Part B contractors' scope shall include OFC cable laying from New Admin Building to BPCLs Township (outside Refinery / Petrochemical area) Tapti Complex and Township Data Center along with the preparation of trench 300 mm (W) x 1000 mm (D).

However, scope of supply & installation of ducts shall be in the respective Part A / Part B contractor scope as per the respective areas as mentioned in the overall duct layout attached with the tender.

Price for item no. 01II.610 mentioned in the Instrumentation SOR shall be quoted considering the activities mentioned in the table above.

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1.53 SITE CONDITIONS

The site environmental site conditions are as follows:

- Ambient temperature (Min & Max): 1.1°C & 45.6°C
- Relative Humidity (%): 16@ t min; 80@ t max
- Rainfall data for 24-hours: 360 mm. Total annual rainfall is 900-1100 mm.

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JOB SPECIFICATION FOR CHEMICAL CLEANING & PASSIVATION OF COMPRESSOR CIRCUITS (SMMS)

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

EPCM : ENGINEERS INDIA LIMITED

JOB NO : B957

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
B	18/12/2024	ISSUED FOR TENDER	JATIN	SAHIL	SRIDHAR
A	25/11/2024	ISSUED FOR FEED	JATIN	SAHIL	SRIDHAR

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ANNEXURE-I: INHIBITOR EFFICIENCY TEST PROCEDURE

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1.0 SCOPE

1.1 This specification covers the requirement of pre-commissioning chemical cleaning and post-cleaning passivation treatment of fabricated and erected carbon steel compressor suction lines, inter stage suction lines, knock out drums and spillback lines of compressors at plant site prior to commissioning by chemicals circulation method. This technical procedure is applicable and suitable only for carbon steel surfaces. Materials other than carbon steel should not come in contact with pickling solutions. Refer clause 1.4 of this specification for exceptions.

1.2 This specification defines the procedure for the chemical cleaning and passivation. However, EPC/LSTK Contractor shall prepare the detailed chemical cleaning markup on the applicable P&IDs and submit for EIL review & approval

1.3 All valves, gaskets, control valves including butterfly valves, filters, venturies, instruments etc. that may be damaged during chemical cleaning should be dropped before chemical cleaning.

1.4 All accessories dropped from the loop prior to cleaning/pickling are to be boxed up as per the procedures after successful completion of cleaning/pickling process and inspection of the loop. After boxing up the loop, the same shall be inspected for completeness by contractor / EIL.

1.5 In case the valves, a portion of piping and equipment made of material other than carbon steel can't be isolated from the loop, then the procedure given in clause 15.0 shall be followed.

1.6 In case of contractor wish to use HCL method then it is mandatory to ensure that, HCL method will not impart any adverse effect to the service or catalysts.

1.7 Where lines are required to be chemically cleaned, the limit of cleaning in branch lines (which are not marked or not necessary) shall be to the first block valve or flange.

2.0 OBJECTIVE

The object of chemical cleaning of carbon steel items is to remove the loose rust, dislodging the burs, welding slag and mill scales adhering to the internal surface so that maintenance of compressors is reduced due to frequent choking of strainers. This procedure specifies the method of cleaning and passivation of internal surface of carbon steel items, based on use of inhibited hydrochloric acid followed by passivation with SHMP (Sodium Hexa-Meta Phosphate), prior to taking in service for the first time after installation/ fabrication.

This cleaning will enable the removal of:

a) Paint or varnish, if used for protective purposes.
b) Grease or oil
c) Mill scales
d) Loose rust
e) Welding slag

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Any deviation from this specification should be recorded and shall have approval from owner/ owner's representative prior to application. The final result of this cleaning is that the metal surfaces are completely clean, dry and passivated without signs of corrosion.

3.0 PREPARATION OF TEMPORARY CIRCUITS AND SPECIFIC REQUIREMENT OF EQUIPMENT AND FACILITIES FOR CARRYING OUT CHEMICAL CLEANING

3.1 The cleaning may be carried out by circulating the specified solutions in the specified sequence and conditions.

3.2 Temporary piping and a pump of appropriate capacity suitable for chemical cleaning may be used for this purpose as part of the circuit.

3.3 The pump capacity shall be adequate to the required head of the highest point of the chemical cleaning circuit and to obtain a flow velocity of approximately 0.5 m/s in the maximum diameter piping of the circuit with full bore liquid flow.

3.4 Flow meter, pressure gauges and temperature gauges at discharge of the pump and highest point of the circuit both shall be installed in the chemical cleaning circuit. The flow, temperature and pressure gauges must have been prior tested, calibrated by the contractor / agency and the calibration certificates shall be submitted to EIL for review prior to the installation in the cleaning /pickling loop.

3.5 All necessary temporary piping, fittings, flanges, pumps, tanks, heater coils, gaskets, thermometers, hydrometers, valves, test coupons, spares, field laboratory facilities with all accessories required for conducting testing during cleaning operation, chemicals and safety accessories for operation personnel etc. shall be arranged by the contractor at site prior to chemical cleaning.

3.6 Approximately one meter length of a rusted spool piece of CS with flange at both the ends and having minimum diameter of 4" or above shall be kept in chemical cleaning circuit so as to visually inspect the same after chemical cleaning and passivation is done.

3.7 The temporary piping should be of carbon steel with minimum 3" dia size including drain line. The chemical solution tank capacity shall be 40% of the hold up volume of the cleaning circuit.

3.8 The contractor should arrange for at least 3 nos. HDPE / MSRL tanks of 10 cubic meter capacity for acid solution, alkali solution and water.

3.9 Heating shall be done by purging of medium Pressure (MP) / Low Pressure (LP) steam or by using boiler / electrical heater etc. In case of heating by media other than steam, the contractor shall arrange the equipment for the same.

3.10 The required number of operating and supervisory manpower to be involved and deployed in the cleaning /pickling operations shall be submitted by the contractor to EIL so as to ensure continuous availability of manpower for supervision, monitoring and making reports during the operation.

4.0 SEQUENCE OF OPERATION

The sequence of operations shall be as follows:

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a) Flushing with water to remove dirt, dust, loose rust and any foreign matter.
b) Degreasing by alkali circulation.
c) Inhibited acid circulation.
d) Neutralization with soda ash / caustic soda.
e) Rinsing.
f) Passivation by SHMP solution circulation.
g) Drying and preservation.

5.0 CHEMICALS

The following chemicals are recommended for use in chemical cleaning operation:

5.1 Caustic Soda- technical grade conforming to IS: 252 (latest edition).

5.2 Hydrochloric acid-commercial / technical grade conforming to IS: 265 (latest edition).

5.3 Corrosion inhibitor- Rodine-213 special or equivalent.

5.4 Glassy SHMP conforming to IS: 574 (latest edition).

5.5 Soda ash, technical grade, conforming to IS: 251 (latest edition).

5.6 Potable water should be used for preparation of chemicals solution and flushing / rinsing operation etc.

5.7 All chemicals used for chemical cleaning should be as per specifications and shall be with test certificates from manufacturers. The same shall be reviewed by EIL. All chemicals used for chemical cleaning shall be tested in owners' laboratory for purity, specific gravity, chlorides, iron (Fe), and other impurities, if any. The same shall be submitted to EIL for review.

6.0 INSPECTION OF CORROSION INHIBITOR EFFICIENCY

A solution of inhibitor shall be prepared in hydrochloric acid as specified by the manufacturer and shall be tested for (a) the inhibitor efficiency and (b) the effectiveness of the solution in removing mill scale as per Annexure-I. The same shall be witnessed by EIL.

7.0 CLEANING PROCEDURE

The chemical cleaning shall be carried out as follows:

7.1 The circuit (loop) shall be checked with circulation of water to test its tightness. Any leakage, if observed, shall be attended and tightened.

7.2 The circuit (loop) shall be flushed with water to remove all extraneous matter, dirt and dust etc.

7.3 Filling and circulation of sodium hydroxide solution for 2 hours (min.)

7.3.1 Temperature of sodium hydroxide solution during circulation should be 55-65^{0}C.

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7.3.2 Concentration of sodium hydroxide should be 20 g/ l (on 100% purity basis).

7.4 Drain the sodium hydroxide solution. Fill with water and drain. This operation of rinsing with water should be continued till the pH of water at inlet and outlet ends are same.

7.5 Filling and circulation of inhibited hydrochloric acid solution for 6 hrs. (min)

7.5.1 Temperature of inhibited hydrochloric acid solution during circulation should be 50-60 ^{0}C.

7.5.2 Concentration of hydrochloric acid solution should be 5-10% (typically 8%) by wt. HCl (on 100% purity basis) and Rodine-213 special or equivalent should be added in the acid solution in proportion of 1 litre of Rodine-213 special or its equivalent to 100 liters of 30-33% HCl. However, exact concentration and duration of acid solution used shall be decided based on visual inspection of carbon steel piping for presence of rust and mil scale.

7.6 Drain the inhibited HCl solution. Fill the system with 1-2 % solution of soda ash or caustic soda and circulate for 1 hour at 40-45 ^{0}C.

7.7 Drain the neutralizing solution. Fill with water and drain. This operation of rinsing with water should be continued till the pH of water at the inlet and outlet ends is same.

7.8 Filling and circulation of SHMP solution for 2 hrs. Then hold for 10-12 hrs.

7.8.1 Concentration of SHMP solution should be 2-3% by wt. (on 67% P2O5 basis).

7.8.2 Temperature of SHMP solution during circulation should be 70-75 deg C.

Note: To prevent re-oxidation, the passivation solution must be introduced immediately after the flushing operation as per clause 7.7.

7.8.3 Drain the passivated solution without flushing with water. Then allow self-drying.

7.9 Finally dry the circuit with clean dry instrument air circulation.

7.10 The operations (7.1 to 7.9) in any one loop, when commenced, must be completed without interruptions.

8.0 OPERATION AND MONITORING:

Satisfactory performance of the chemical cleaning depends upon proper operation. Following steps should be considered during preparation of loops and operation:

8.1 Full bore flow should be ensured while circulating various chemicals. Pressure and temperature gauges shall be provided in the circuit for monitoring of pressure and temperature during the chemical cleaning job.

8.2 Vents should be provided in all high points including large diameter horizontal pipes for effective removal of air and acid fumes during cleaning operation. All vents should be operated intermittently to ensure full bore flow throughout the operation and no air pockets should be left in the system during pickling operation.

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8.3 Drain valves should be provided at all low points for effective circulation of pickling solution and removal of sludge, if any, and no trapping of chemicals at time of changing of chemicals.

8.4 Suitable high-pressure pumps of at least 100 HP capacity with 50 m head and with necessary flow rate of 50-100 m^3/hr should be provided to maintain good velocity (approximately 0.5 m/s) throughout operation and there should be effective return of flow from all outlets and vent lines. Minimum two pumps should be provided (one under operation and another standby). The pumps should be of adequate head to maintain the required velocity in the circuit. The efficiency of pump should be checked periodically.

8.5 While preparation of loop, equipment like coolers and suction drums should not be taken into circuit. Pickling of equipment or suction drums should be done separately.

8.6 Flushing should be done with high velocity water in reverse direction for effective removal of dirt, dust, loose rust and any foreign matter etc.

8.7 The corrosion inhibitor efficiency should be determined in the laboratory before pickling is started and witnessed by EIL.

8.8 All chemicals should be tested as per specifications before use. The contractor should also furnish the test certificates for all chemicals used for pickling operation for review by EIL.

8.9 Whenever acid is added, the corrosion inhibitor should be added first.

8.10 Standard solution for determination of iron in acid solution is required prior to pickling operation.

8.11 During pickling operation, 2 weighted carbon steel test coupons should be exposed, one inside the inhibited acid solution in the tank and another at the return line. The mill scale free coupons should be removed after acid circulation is over for determination of loss of weight. The coupons with mill scale are intended for indicating removal of mill scale after acid circulation and can be removed after completion of operation for final inspection.

8.12 Acid strength, total iron and ferric iron should be determined every hour during operation. Periodically acid strength should also be checked from all outlets, vents and drain lines.

8.13 After acid pickling and neutralization, water flushing will be carried out and continued till a pH ~ 7.0 is obtained at outlets so that it facilitates the subsequent passivation with sodium hexametaphosphate.

8.14 During SHMP circulation, presence of phosphate should be checked from all outlets, vents and drain lines.

8.15 All data should be recorded in checklist during pickling operation including chemicals consumption and observations, if any.

8.16 Segment(s) of CS piping, if any, which cannot be conveniently cleaned by chemicals circulation method may be cleaned by filling and/or dipping/immersion method. All the conditions of above operations are generally applicable for this method.

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9.0 CONTROLS FOR THE CLEANING PROCESS

9.1 All the specified parameters shall be followed during the cleaning process. All tests should be conducted by the contractor to control the process.

9.2 The strength of the cleaning solutions shall be checked for acid concentration every hour during the cleaning operation. If the strength is found to below 5% by wt., the solution shall be drained in part and brought in the specified range of 5-10% wt. by addition of fresh acid.

9.3 The total iron and ferric iron content of the cleaning solution should be monitored to avoid the attack on the metal. The total iron content shall not exceed 5000 mg as Fe in 1 liter of the cleaning solution. The limits for iron as ferric iron shall not exceed 0.4% by wt. If the limits for total iron and ferric iron are attained, the cleaning solution shall be drained in part and brought in the specified range by addition of fresh solution.

9.4 During the cleaning / pickling operations, care should be taken not to exceed the design temperature and pressure of the loop at any point of time.

10.0 PRESERVATION

The pickled and passivated lines should be preserved in clean and dry condition. The necessary preservation procedure should be followed as recommended by EIL/ owner as per the preservation period. The preservation shall be done by filling with nitrogen if the compressor is not commissioned immediately.

11.0 NEUTRALISATION

Contractor shall finalize the disposal scheme in consultation with OWNER/PMC before start of the chemical cleaning activity and shall comply to all the necessary OWNER's requirements. The contractor shall make necessary arrangement for complete neutralization of all effluents like acids & alkalis. The effluents shall be analyzed before discharging and if necessary, additional chemicals shall be added for neutralization so that discharged mixtures shall have pH ~7.0.

12.0 INSPECTION

In the temporary piping loop, a temporary carbon steel spool of approximately one meter length shall be incorporated at a suitable location. After pickling and drying operation, visual inspection of the temporary spool, coupons and of the loop should be carried out at convenient location(s) as seen from ends to ensure the surfaces are completely clean, dry and free from rust giving uniform gray appearance on the original surface. The visual observations shall be recorded.

13.0 SAFETY PRECAUTIONS

The alkali and hydrochloric acid solutions involved for chemical cleaning are corrosive for the skin and proper care shall be taken in the handling of the chemicals.

13.1 Adequate ventilation shall be provided during the acid cleaning operation to protect the health of workmen.

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13.2 The handling of acid preparation bath etc. and heating must be supervised by a competent supervisor.

13.3 Safety goggles shall be worn by operators and workmen during pickling operation.

13.4 Rubber aprons, protective boots and hand gloves shall be worn by workmen.

13.5 Temporary barricades shall be provided around the areas where acid and alkali is being handled and entry in to the barricaded areas shall be strictly with proper safety gears

14.0 TECHNICAL SUPERVISION AND QUALITY ACCEPTANCE

The chemical cleaning operation should be conducted under close chemical controls by the contractor and EIL site construction department. The EIL site may have technical guidance from the EIL, Process department during the execution and quality acceptance. SMMS may be consulted for technical guidance for initial startup during the execution the chemical cleaning and passivation. The acceptance of cleaning shall be done by EIL site as per the contractual requirements.

15.0 ALTERNATE PROCEDURE TO BE USED IN CASE OF CS/ LOW ALLOY STEEL IN COMBINATION WITH SS

PROCEDURE FOR CHEMICAL CLEANING OF CARBON STEEL, LOW ALLOY STEELIN COMBINATION WITH STAINLESS STEEL PIPING AND STAINLESS STEELVALVES /VESSELS, PRIOR TO COMMISSIONING BY INHIBITED AMMONIATED CITRIC ACID CIRCULATION METHOD.

1.0 SCOPE

This specification covers the chemical cleaning (pickling) of the fabricated and erected, carbon steel, low alloy steel and with stainless steel combination piping at site prior to commissioning by chemicals circulation method. The technical specifications describe the procedure and sequence of operations for chemical cleaning (pickling) and passivation of the piping.

2.0 OBJECTIVE

The objective of chemical cleaning of, carbon steel, low alloy steel with stainless steel combination piping is to remove the loose rust, dislodging the burs, welding slag and mill scales adhering to the internal surfaces of piping. The procedure specifies the method of cleaning and passivation of internal surface of piping based on the use of ammoniated citric acid followed by passivation with tri-sodium phosphate (Na_3PO_4) + $NaNO_2$ circulation. Any deviation from this specification should be recorded and discussed with owner/EIL prior to application.

3.0 SEQUENCE OF OPERATION

The cleaning of piping shall be carried out in the following sequence:

(a) Flushing with potable water to remove dirt, dust, loose rust and foreign matter followed by DM water flushing.

(b) Degreasing with potassium hydroxide (caustic potash).

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(c) Flushing with DM water till inlet and outlet water pH is same

(d) Circulating with ammoniated inhibited citric acid

(e) Flushing with DM water

(f) Circulating with tri-sodium phosphate (Na_3PO_4) + sodium nitrite (NaNO2)

(g) Drain, dry and take the system into service

(h) If the pipe is not taken into service immediately after drying the pipe should be filled with N2 and capped at both ends.

4.0 PREPARATION OF TEMPORARY CIRCUITS

Temporary piping, pumps of suitable capacity, fittings, flanges, tanks, gaskets, heating arrangement, hydrometers, valves, test coupons, spares, laboratory facilities with all accessories required for conducting tests during cleaning operation, chemicals and safety accessories for operation, personnel etc. shall be arranged by contractor at site prior to cleaning operation. Quantity of chemicals required should be calculated based on the holdup volume of the temporary circuit.

5.0 PROCEDURE

5.1 The circuit (loop) shall be checked with circulation of potable water to check tightness. Any leakage if observed to be attended and tightened.

5.2 The circuit (loop) shall be flushed initially with potable water to remove all extraneous matter, dirt and dust etc. followed by DM water flushing.

5.3 Filling and circulation of potassium hydroxide (caustic potash) solution of 2% concentration on 100% purity basis in DM Water at 55-65^{0}C temperature for 2 hours.

5.4 Drain the potassium hydroxide solution. Fill with DM water and drain. The operation of rinsing with DM water should be continued till pH of water at inlet and outlet ends are same.

5.5 Filling and circulation of ammoniated citric acid of 3% concentration by weight (on 100% purity basis) in DM water with pH being adjusted to 3.5-4.0 with ammonia and 0.1% corrosion inhibitor Rodine 92 or equivalent by weight. The temperature of circulating citric acid solution should be 80^{0}C. The circulation should be continued for 6 hrs.

5.6 During circulation of ammoniated citric acid, the total iron content of the circulating solution should not exceed 5000 mg/l (with 3% w/w citric acid solution) and pH should be maintained at 3.5-4.0. If at any stage total iron content exceeds 5000 mg/l, the acid should be drained in part and replaced with fresh acid.

5.7 Drain the citric acid and rinse with DM water. Fill with DM water and the operation of rinsing with potable water should be continued till pH at inlet and outlet ends of water are same.

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5.8 Fill with tri-sodium phosphate (1%) + sodium nitrite (0.5%) by weight (on 100% purity basis) and circulate for 2 hours. Drain, allow to self dry and finally dry with compressed air.

5.9 Suitable high pressure pumps with necessary flow rate should be provided to maintain good velocity (preferably 0.5m-1m/s) throughout operations of chemical cleaning and there should be effective return of flow from the outlet and the vent.

6.0 CHEMICALS

Chemicals used for chemical cleaning should conform to the following specifications.

6.1 Citric acid monohydrate, conforming to IS:5464-1970 Gr.2
6.2 Corrosion inhibitor Rodine 92 or equivalent
6.3 Ammonia liquor technical grade, conforming to IS: 799-1978
6.3 Potassium hydroxide (KOH) conforming to IS:6831 latest edition
6.5 Tri sodium phosphate (Na_3PO_4) technical grade as per IS:573.
6.6 $NaNO_2$ IS-879-1981 sodium nitrite
6.7 Potable water for flushing should have chlorides of 50 ppm maximum.
6.8 DM water.

7.0 SAFETY PRECAUTIONS:

The alkali and acid solutions involved for chemical cleaning are corrosive for the skin and proper care shall be taken in the handling of the chemicals.

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ANNEXURE-I

INHIBITOR EFFICIENCY TEST PROCEDURE

1.0 PREPARATION OF TEST COUPONS

Carbon steel coupons of size 7.5cm x 5cm shall be cut from hot rolled (AISI 1020 or equivalent grade) steel strip or plate. The edges and sharp corners shall be ground smooth. A 5mm diameter hole shall be provided for suspension. The coupons thus prepared shall be used in the tests.

2.0 IDENTIFICATION

The coupons shall be provided with letters and/ or number at one corner using punch.

3.0 SURFACE PREPARATION

For conducting the test to determine inhibitor efficiency the coupons shall be free from mill-scale by grinding followed by polishing using emery paper. The final surface shall be bright using Oakey emery paper No.0. Coupons for conducting the test of action of cleaning solution in removing mill-scale shall be in the as received condition of the surface i.e. with the mill scale on.
All the coupons shall be weighed separately correct to 1mg using a balance.

4.0 CLEANING SOLUTION

The cleaning solution is the inhibited hydrochloric acid. The concentration of hydrochloric acid solution should be 5-10% by wt. and inhibitor should be added in the proportion of 1 litre Rodine 213(special) or equivalent to 100 litre commercial hydrochloric acid(30-33% wt./wt.). The solution, thus, prepared shall match with the actual solution to be used in the chemical cleaning. The acid strength of the solution shall be determined by titration with standard alkali.

5.0 TEST FOR INHIBITOR EFFICIENCY

Test shall be carried out in duplicates in glass containers preferably in one litre capacity beakers. One litre of cleaning solution each shall be transferred to beakers and the solution shall be heated to the maximum temperature in the specified range for the process. The coupons shall be completely exposed to the action of the acid by suspension from the hole so that the upper edge shall be at least 1cm below the liquid surface. The temperature shall be held as above through-out the duration of the test.

5.1 Identical test shall be carried out using un-inhibited acid of the strength equivalent to that of the cleaning solution.

5.2 After the exposure of the coupons to the cleaning solution for the duration of actual cleaning, all the coupons shall be removed from the acid solution and clean is running tap water to remove acid and finally in distilled water. The coupons shall be dried and transferred to desiccator before weighing.

5.3 The weight loss of the coupons shall be determined and the corrosion rates calculated. The average corrosion rate of the coupons exposed to the cleaning solution shall be less

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5.4 than 3% of the average rate thus obtained for the coupons exposed to uninhibited acid. (I.e. percent corrosion inhibition should be 97% (min.). Approval of the Engineer-in-Charge should be obtained for the inhibitor efficiency obtained in the test.

5.5 If chemical cleaning using citric acid method is being adopted, Rodine 92 (or equivalent) shall be used for the efficiency test in line with the procedure mentioned in this annexure.

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JOB SPECIFICATION FOR CHEMICAL CLEANING OF VHP / HP STEAM PIPING (SMMS)

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

EPCM : ENGINEERS INDIA LIMITED

JOB NO : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
B	18-12-2024	ISSUED FOR TENDER	JATIN	SAHIL	S.SRIDHAR
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1.0 SCOPE

This technical specification covers the minimum requirement for chemical cleaning and passivation of the fabricated and erected carbon steel VHP/HP Steam piping at site prior to commissioning by chemical circulation method.

This specification defines the procedure for the chemical cleaning. However, EPC/LSTK Contractor shall prepare the detailed chemical cleaning markup on the applicable P&IDs and submit for EIL review & approval.

2.0 OBJECTIVE

The objective of chemical cleaning of carbon steel VHP/HP Steam piping is to remove the loose rust, dislodging the burs, welding slag and mill scales adhering to the internal surfaces of piping. This procedure specifies the method of cleaning and passivation of internal surface of piping based on the use of inhibited ammoniated citric acid followed by passivation with Tri sodium phosphate (Na_3PO_4) + Sodium nitrate ($NaNO_2$) circulation. Any deviation to this specification should be recorded and discussed with OWNER/EIL prior to application.

3.0 SEQUENCE OF OPERATION

The cleaning of piping shall be carried out in the following sequence:-

(a) Flushing with potable water to remove dirt, dust, loose rust and foreign matter followed by DM / BFW water flushing.
(b) Degreasing with Sodium Hydroxide (caustic Soda).
(c) Flushing with DM/ BFW till inlet and outlet water pH is same.
(d) Circulating with ammoniated inhibited citric acid
(e) Flushing with DM/ BFW
(f) Circulating with Tri sodium phosphate (Na_3PO_4) + Sodium Nitrite ($NaNO_2$)
(g) Drain, dry and take the system into service
(h) If the pipe is not taken into service immediately after drying the pipe should be filled with N2 and capped at both ends.

4.0 PREPARATION OF TEMPORARY CIRCUITS:

Temporary piping, pumps of suitable capacity, fittings, flanges, tanks, gaskets, heating arrangement, hydrometers, valves, test coupons, spares, laboratory facilities with all accessories required for conducting tests during cleaning operation, chemicals and safety accessories for operation, qualified personnel etc. shall be arranged by contractor at site prior to cleaning operation. The contractor of chemical cleaning shall prepare all the necessary temporary chemical cleaning circuits at site and submit for approval by owner before execution. Quantity of chemicals required should be calculated based on the total hold-up volume. Pumps of suitable capacity shall be arrange at site by the contractor.

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5.0 PROCEDURE

5.1 The circuit (Loop) shall be checked with circulation of potable water to check tightness. Any leakage if observed to be attended and tightened.

5.2 The circuit shall be flushed initially with potable water to remove all extraneous matter, dirt and dust etc. followed by DM water flushing.

5.3 Filling and circulation of sodium Hydroxide (caustic soda) solution of 1% wt in DM/BFW (concentration on 100% purity basis) at 65-75^{0}C temperature for 2 hrs.

5.4 Drain the sodium Hydroxide solution. Fill with DM/BFW and drain. The operation of rinsing with DM water should be continued till pH of water at inlet and outlet ends are same.

5.5 Filling and circulation of ammoniated citric acid of 3% concentration (on 100% purity basis) by weight in DM/BFW with pH being adjusted to 3.5 - 4.0 with ammonia and 0.1% corrosion inhibitor Rodine- 92 or equivalent by weight. The temperature of circulating citric acid solution should be 80^{0}C. The circulation should be continued for 6 hrs. or till iron and acid concentration are stabilized.

5.6 During circulation of ammoniated citric acid, the total iron content of the circulating solution should not exceed 5000 mg/litre (with 3% w/w citric acid solution) and pH should be maintained at 3.5-4.0. If at any stage total iron content exceeds 5000 mg/liter, the acid should be drained in part and replaced with fresh acid.

5.7 Drain the citric acid and rinse with DM/BFW. Fill with DM/BFW and the operation of rinsing should be continued till pH at inlet and outlet ends of water are same.

5.8 Fill with Tri Sodium phosphate (1%) + Sodium Nitrite(0.5%) by weight (on 100% purity basis) and circulate for 2 hrs. drain, allow to self dry and finally dry with compressed instrument air.

5.9 If the pipe is not taken into service immediately after drying, the pipe should be filled with N2 and capped at both ends.

5.10 Suitable highpressure pumps with necessary flow rate should be provided by the contractor to maintain good velocity (preferably 0.5-1.0 M/Sec.) throughout operations of chemical cleaning and there should be effective return of flow from the outlet and the vent.

6.0 CHEMICALS & UTILITIES

Chemicals used for chemical cleaning should conform to the following specifications.

6.1 Citric acid monohydrate conforming to IS : 5464-1970-Gr.2 (latest edition)

6.2 Rodine 92 or equivalent

6.3 Ammonia (Technical grade.)

6.4 Sodium Hydroxide (NaOH) Technical grade conforming to IS:252 latest edition

6.5 Tri sodium phosphate (Na_3PO_4) technical grade as per IS :573

6.6 $NaNO_2$ IS-879-1981 (latest edition)

6.7 Potable water (chlorides 50ppm maximum)

6.8 DM water

7.0 NEUTRALIZATION AND DISPOSAL OF CHEMICALS

The necessary arrangement for neutralization like HDPE tank/temporary neutralization pit shall be made available for complete neutralization of pickling acids and alkalis. Prior to discharging of effluent in the sewer system, it shall be analyzed and if necessary, additional chemicals shall be added for complete neutralization so that discharged mixtures shall have pH 7.0 in order to prevent any damage to

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paving, manholes and sewers etc. Permission shall be taken from engineer-in-charge/OWNER for disposal of neutralized effluent into storm water drain / nearest Effluent pit etc.

8.0 SAFETY PRECAUTIONS

The alkali and acid solutions involved for chemical cleaning are corrosive for the skin and proper care shall be taken in the handling of the chemicals.

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JOB SPECIFICATION FOR EXTERNAL CHEMICAL CLEANING AND PASSIVATION OF SS WELDS AND FITTINGS OF TANKS AND PIPES (SMMS)

PROJECT : **MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED**

EPCM : **ENGINEERS INDIA LIMITED**

JOB NO. : **B957**

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1.0 SEQUENCE OF OPERATION

2.0 PICKLING PROCEDURE

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RECOMMENDED PROCEDURE FOR EXTERNAL CHEMICAL CLEANING AND PASSIVATION OF WELD JOINTS OF SS TANKS AND PIPES

1.0 SEQUENCE OF OPERATION

The sequence of operation shall be as follows:

1.1 Wash with D.M. water

1.2 Applying the acid pickling paste.

1.3 Final wash with DM water

2.0 PICKLING & PASSIVATION PROCEDURE

2.1 Wash the girth weld joints, tees elbows of SS with DM water.

2.2 Prepare a paste with 15% concentration Nitric acid (on 100% purity basis), 0.1% hydrofluoric acid (on 100% purity basis) and with required quantity of Silica insulation fine grog of 0-0.5mm size with minimum 85% SiO_2. Apply the paste on SS welds joints, and fittings which needs to be cleaned, with a uniform thickness. Allow the paste to be on the surfaces for about 30 minutes.

2.3 Remove the acid paste and wash with DM water thoroughly without any traces of paste.

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JOB SPECIFICATION FOR SURFACE PREPARATION AND PROTECTIVE COATING (SMMS)

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED

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Abbreviations:

AS	:	Alloy Steel
ASTM	:	American Society for Testing and Materials
AWWA	:	American Water Works Association
CS	:	Carbon Steel
DFT	:	Dry Film Thickness
GI	:	Galvanized Iron
ID	:	Internal Diameter
ISO	:	International Organization for Standardization
LTCS	:	Low temperature Carbon Steel
MS	:	Mild Steel
MR	:	material requisition
NB	:	Nominal Bore
NA	:	Not applicable
OD	:	Outside Diameter
OEM	:	Original Equipment Manufacturer
OSHA	:	Occupational Safety and Health Act
RCC	:	Reinforced Cement Concrete
RH	:	Relative humidity
SS	:	Stainless Steel
SOR	:	Schedule of Rate
SSPC	:	Steel Structure Painting Council
WFT	:	Wet Film Thickness
EIC	:	Engineer-In-Charge
SMMS	:	Specialist Materials & Maintenance Services

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1.0 GENERAL

1.1 This specification shall be applicable for the work covered by the contract and without prejudice to the provisions of various international codes of practice, standard specifications etc. It is understood that the CONTRACTOR shall carry out the work in all respects with the best quality of materials and workmanship and in accordance with the best engineering practice and instructions of Engineer-In-Charge in consultation with EIL-SMMS.

1.2 This specification covers the requirement for protective coating for new construction, revamp and refurbishment.

2.0 SCOPE

2.1 Scope of work covered in the specification shall include, without being limited to, the following:

This specification defines the requirements for surface preparation, selection and application of primers and coatings on external surfaces of items mentioned in clause 2.2 of this specification and quality control, inspection & testing of the coating systems. The items listed in clause 2.2 and the heading of tables of paint systems are non-exhaustive. However, the CONTRACTOR is fully responsible for carrying out all the necessary painting, coating and lining job on external and internal surfaces as per the contract requirement, technical data sheets and drawings etc.

As a special requirement of this PROJECT, Contractor/fabricator/supplier of insulated equipment like vessels, reactors, columns and equipment shall identify the type of under insulation coating required based on the criticality of the equipment in consultation with BPCL/EIL. Prior approval of BPCL/EIL is a mandatory requirement in this case.

2.2 Extent of work covered in this specification

2.2.1 The following surfaces and materials shall require shop, pre-erection and field painting, as applicable:

a. All Carbon Steel structures.

b. All Carbon Steel and Alloy steel piping, equipment, valves, fittings & stacks.

c. All Carbon Steel and Alloy steel tanks.

d. Tanks internal as per applicable datasheets, drawings & contract requirements.

e. All insulated CS, LAS, & alloy steel pipes, equipment, vessels, reactors, valves, fittings & stacks.

f. All insulated SS, DSS & SDSS pipes, equipment, vessels, reactors valves, fittings, vessels & stacks.

g. All insulated critical CS, LTCS. SS & alloy steel equipment like vessels, reactors, column & equipment

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(application of Thermally sprayed aluminum coating based on the criticality)

h. All structural steel supports, walkways, handrails, ladders, platforms etc.

i. Flare lines, external surfaces of steel chimney with or without refractory lining and internal surfaces of steel chimney without refractory lining.

j. RCC structures as per applicable drawings/relevant documents.

2.2.2 Marking and Identification of painted items:

a. Identification of color bands on all piping, as required, including aluminum cladding over insulation, galvanized, SS and nonferrous piping.

b. Identification lettering/ numbering on all painted surfaces of equipment/piping, aluminum cladding over insulation, galvanized, SS and non-ferrous piping.

c. Marking / identification signs on painted surfaces of equipment and piping including hazardous service.

2.2.3 Supply and prequalification testing of all primers, paints and all other materials required for painting (other than OWNER supplied materials)

2.2.4 Application of pre-erection/fabrication and shop primer.

2.2.5 Repair work of damaged pre-erection/ fabrication and shop primer and weld joints in the field/site before and after erection.

2.2.6 Quality control, testing and inspection during all stages of work (surface preparation, application of coating and testing of applied coating).

2.2.7 Exclusions:

(a). All metallic surfaces do require painting except for following materials. These materials are not painted unless specified by the contractual provisions and the same shall be painted as per the relevant specifications:

- Un-insulated stainless steel.
- Plastic and/or plastic-coated materials.
- Galvanized Iron.
- Aluminum.
- Ni-Alloys.
- Glass.
- Ceramics.
- Machined surfaces.

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- Label and names plates.

Note: Galvanized steel doesn't require painting for corrosion protection. However, if painting is mandated due to OWNERs instructions/contractual provision/ for colour coding requirement mentioned in this specification or by OWNER, then the coating system in Table 4.0 shall be followed.

(b). This specification does not include fire retardant paints/intumescent epoxy coatings for steel structure, and the EIL specification B957-999-06-43-IF01 addresses the same.

3.0 REFERENCE CODES & STANDARDS

3.1 Latest editions of the following codes and standards are applicable for the work covered by this specification:

American Society for Testing and Materials (ASTM):

ASTM Volume 6.01	Paint - Tests for Chemical, Physical, and Optical Properties; Appearance
ASTM Volume 6.03	Paint -- Pigments, Polymers, Resins, Naval Stores, Cellulosic Esters, and Ink Vehicles
ASTM D6677	Standard Test Method for Evaluating Adhesion by Knife
ASTM D5894	Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM D870	Standard Practice for Testing Water Resistance of Coatings Using Water Immersion
ASTM D2485	Standard Test Methods for Evaluating Coatings for High Temperature Service
ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D4060	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D4752	Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D4940	Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blast Cleaning Abrasives
ASTM D4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

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ASTM C868	Standard Test Method for Chemical Resistance of Protective Linings
ASTM G42	Standard Test Method for Cathodic Disbonding of Pipeline Coatings Subjected to Elevated Temperatures
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D1475	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D823	Standard Practices for Producing Films of Uniform Thickness of Paint, Coatings and Related Products on Test Panel
ASTM D2369	Standard Test Method for Volatile Content of Coatings
ASTM D1640/D1640M-14	Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
ASTM D522/D522M	Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1044	Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion
ASTM D1849	Standard Test Method for Package Stability of Paint
ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity
ASTM D5146	Standard Guide to Testing Solvent-Borne Architectural Coatings
ASTM D4258	Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4259	Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application

Steel Structures Painting Council (SSPC)

SSPC SP-1	Solvent cleaning
SSPC Painting manual Vol.1	Good Painting practices
SSPC Painting manual Vol.2	Systems & specification
SSPC VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC AB1	Mineral and Slag Abrasives
SSPC PA 2	Measurement of Dry Paint Thickness with Magnetic Gauges
SSPC-PA-9	Measurement of Dry Coating Thickness Using Ultrasonic Gages

Association for Materials Protection and Performance (AMPP)

NACE RP 0287	Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
NACE SP 0198	Control of Corrosion under Thermal Insulation and Fireproofing Materials

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NACE SP 0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

International Organization for Standardization (ISO):

ISO 12944	Corrosion Protection of steel Structures by Protective Paint System
ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles-Specifications and test methods.
ISO 8501-1/ SIS-05 59 00	Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness— Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
ISO 8502-3	Preparation of steel substrates before application of paints and related products -Tests for the assessment of surface cleanliness - Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)
ISO 8502-9	Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness—Part 9: Field method for the conductometric determination of water-soluble salts
ISO 2808	Paints and varnishes - Determination of film thickness
ISO 2811	Paints and varnishes — Determination of density

Other Standards

IS 5	Colors for ready mix paints and enamel
NORSOK M-501	Surface preparation and protective coating
RAL CLASSIC	Color matching system
ACI 308	External Curing of Cast-in-Place Concrete— Specification
ACI 301	Specifications for Structural Concrete
ACI 562	Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures
ACI 546	Concrete repair guide

4.0 SURFACE PREPARATION

4.1 General

Adhesion of the paint film to the surface depends largely on the degree of cleanliness of the metal surface and proper surface preparation have large contribution to the success of the paint protective system. Following method shall be employed for surface preparation:

a. Abrasive blast cleaning: Applicable in all cases.
b. Mechanical or power tool cleaning: Shall be used for repair & touch up, and any other area due to practical constraints with prior permission from EIL Engineer-in charge.

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4.2 Applicable Standards:

Latest editions of the following codes and standards are applicable for the surface preparation work:

TABLE-1: SURFACE PREPARATION STANDARDS

Sl. No.	GRADE OF SURFACE CLEANLINESS	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)		
		ISO 8501-1/ SIS-05 59 00	SSPC, USA	NACE, USA
1.	Solvent cleaning	-	SSPC-SP-1	-
2.	Manual or hand tool cleaning	St 2	SSPC-SP-2	-
3.	Mechanical or power tool cleaning	St 3	SSPC-SP-3	-
4.	White metal	Sa 3	SSPC-SP-5	NACE No.1
5.	Near white metal	Sa 2½	SSPC-SP-10	NACE No.2
6.	Commercial Blast	Sa 2	SSPC-SP-6	NACE No.3
7.	Brush-off Blast for SS, galvanized steel and non-ferrous metals	-	SSPC-SP-16	-
8.	Surface Preparation of Concrete	-	SSPC-SP-13	NACE No.6

4.3 Sequence of surface preparation:

4.3.1 Solvent Cleaning

Mill scale, rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. Unless otherwise specified, surface preparation shall be done as per provisions of relevant tables given elsewhere in this specification. Before surface preparation by blast cleaning, the surface shall be cleaned to remove all grease, oil etc. as per SSPC-SP-1.

4.3.2 Blast cleaning with abrasives

The surfaces shall be blast cleaned using one of the abrasives listed below and at an appropriate distance & angle depending on nozzle size maintaining constant velocity and pressure.

a. The quality of abrasives shall be free from contaminants and impurities and shall meet the requirements of SSPC AB1.

b. The compressed air shall be free from moisture and oil.

c. On completion of blasting operation, the blasted surface shall be clean and free from any scale or rust. Blast cleaning shall not be done outdoors in bad weather without adequate protection. If there is dew on the metal surface, it shall be cleaned. If possible, a vacuum collector shall be installed to collect and recycle the abrasives.

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d. Surface roughness profile: The surface roughness profile for carbon steel and low alloy steels to be coated shall be in accordance with the written recommendations of the paint Manufacturer and shall be measured as per ASTM D4417, method B. When roughness profile is not specified by the paint Manufacturer, then surface roughness profile as specified below in this specification shall be followed.

- The surface roughness profile shall be between 40 µm and 70 µm for coatings up to thickness 500 µm and between 70 µm and 125 µm for coating systems over 500 µm thickness. In all cases, the surface roughness shall have a sharp angular profile.

- If stainless steel, hot dip galvanised or non-ferrous metal surfaces are to be painted then blast cleaning shall be carried out as per SSPC-SP-16, using a fine non-iron containing abrasive.

- On galvanised surfaces, the zinc layer shall not be damaged; a smooth uniform surface roughness shall be achieved. No defects such as break through or crisping of the zinc layer shall occur. The surface roughness shall be in the range of 20 µm to 30 µm or as agreed with the paint Manufacturer.

e. Abrasives: Abrasive for use in blast cleaning steels shall be in accordance with ISO 8504-2. Steel or iron grit is commonly used as recyclable abrasives. When steel shot is used, it shall be used together with steel grit. The shot content of such a mix shall not exceed 67 %.For blasting stainless steel, non-(free) iron containing abrasive shall be used, e.g. Garnet or aluminium oxide. Abrasives used for blast cleaning shall be free from oil, grease, moisture, chloride contamination etc. and shall have crystalline silica not more than 1%.

Test methods for abrasives shall be in accordance with the tests specified in the ISO 11125 and ISO 11127 series for metallic and non-metallic abrasives respectively. Each batch of abrasive should be tested to check that the abrasive meets the requirements as specified in the relevant ISO standard. The conductivity of non-metallic abrasives to be used for stainless steels shall be maximum 15 mS/m. For all other non-metallic abrasives, the conductivity shall not exceed 25 mS/m. OWNER/PMC shall approve the use of alternative abrasive materials. Abrasive used shall be as per following specification:

Type	Generic Name	Standard
Metallic	Iron grit	ISO 11124-2
	Steel grit	ISO 11124-3
Natural mineral	Staurolite	ISO 11126-9
	Garnet	ISO 11126-10
Synthetic material	Aluminium oxide	ISO 11126-7
	Cu Slag	ISO 11126-3

Note:

Aluminum oxide or other abrasive (free from any chloride or iron/steel contamination) shall be used for blasting stainless steel. Copper slag and sand shall not be used.

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4.3.3 Mechanical or power tool cleaning

Power tool cleaning shall be done by mechanical striking tools, chipping hammers, grinding wheels or rotating steel wire- brushes. Excessive burnish of the surface shall be avoided as it can reduce paint adhesion. On completion of cleaning, the detached rust, mill scale etc. shall be removed by clean rags and /or washed by water/steam and thoroughly dried with compressed air jet before application of paint.

4.4 General Notes for surface preparation/blasting and paint application:

a. Surface shall not be coated in rain, wind or in an environment where injurious airborne elements exist.

b. Surface shall not be coated when the steel surface temperature is less than 3°C above dew point.

c. Surface shall not be coated, when the relative humidity is greater than 85%.

d. Surface shall not be coated when the temperature is below 10°C and the ambient/substrate temperature is below the paint manufacturers recommended temperature of application and curing.

e. Surface shall not be coated when surface temperature is greater than 40°C (unless a higher temperature is agreed by the paint manufacturer)

f. The paint application shall not be done when the wind speed exceeds 20 km per hour.

g. The illuminance during coating and inspection shall be at least 500 Lux.

4.5 Use of Dehumidifier

In case of internal coating of storage tanks, dehumidifier shall be used to control humidity level below 60%. Dehumidifier should depress the dew point of air in the enclosed space, sufficient enough so as to maintain it more than 3ºC below the metal substrate temperature during entire period of blasting and coating application. During the interval time between application of primer coat and subsequent intermediate and top coats or between blast cleaning completion and start of application of primer coat, dehumidifier unit should be in continuous operation to ensure that no condensation occurs on the substrate.

The Engineer in-Charge shall have the right to disallow usage of dehumidifier if the performance is not meeting the specified requirements. Under such circumstances, the CONTRACTOR shall remove the equipment and replace the same with another equipment to provide satisfactory results without any additional cost to the OWNER.

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4.6 Surface preparation of concrete:

The external surface of RCC to be painted shall be dry and clean. Any loose particle of sand, cement, aggregate etc. shall be removed and surface shall be prepared as per SSPC-SP-13.

5.0 COATING APPLICATION

5.1 Blast cleaned surface shall be coated with complete application of primer as soon as practicable but in no case later than 4 hours the same day. However, at times of unfavorable weather conditions, the Engineer-In-Charge shall have the liberty to control the time period, at his sole discretion and/or to insist on re-cleaning before primer application is taken up. In general, during unfavorable weather conditions, blasting and painting shall be avoided as far as practicable.

5.2 To the maximum extent practicable, each coat of paint shall be applied as a continuous film with uniform thickness and free of probes. Any spots or areas missed in application shall be re-coated and permitted to dry before the next coat is applied.

5.3 Each coat shall be in proper state of cure or dryness before the application of succeeding coat. Material shall be considered dry for re-coating when an additional coat can be applied without the development of any detrimental film irregularities such as lifting or loss of adhesion of the under coat. Manufacturer's instructions shall be followed for inter-coat interval.

5.4 When the successive coat of the same colour have been specified, alternate coat shall be tinted, when practical, sufficiently to produce enough contrast to indicate the complete coverage of the surface. The tinting material shall be compatible with the material underneath and shall not be detrimental to its service life and shall be recommended by the original paint manufacturer.

5.5 Airless spray application shall be in accordance with steel structure paint manual Vol.1 & Vol.2 by SSPC, USA

5.6 Brush application of paint shall be in accordance with the following:

a. Brushes shall be of a style and quality that will enable proper application of paint.

b. Round or oval brushes are most suitable for rivets, bolts, irregular surfaces, and rough/ pitted steel. Wide flat brushes are suitable for large flat areas but they shall not have width over 5 inches.

c. Paint shall be applied into all corners.

d. Any runs or sags shall be brushed out.

e. There shall be a minimum of brush marks left in the applied paint.

f. Surfaces not accessible to brushes shall be painted by spray, daubers, or sheepskin.

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5.7 Applied paint should have the desired wet film thickness specified by manufacturer. For each coat, the painter should know the WFT corresponding to the specified DFT and standardize the paint application technique to achieve the desired WFT. This has to be ensured in the qualification trial.

5.8 Irregular surfaces such as sharp edges, welds, small brackets, and interstices may stripe coated to ensure specified DFT is achieved. Paint manufacturer recommendation should be followed before deciding for brush application.

5.9 Unless otherwise instructed, final coating (i.e. application of field primer, intermediate and top coats) on pre-erection/ shop primed equipment shall be applied at site, only after all welding & testing like NDT are completed as well as after completion of steam blowing.

5.10 Drying of coated surfaces

a. No coat shall be applied until the preceding coat has dried. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of undercoats. Drying time of the applied coat should not exceed maximum specified for it as a first coat. If this exceeds, the paint material has possibly deteriorated or mixing is faulty.

b. No paint shall be force dried under conditions which will cause chalking, wrinkling, blistering formation of pores, or detrimentally affect the conditions of the paint.

c. No drier shall be added to paint on the job unless specifically called for in the manufacturers' specification for the paint.

d. Paint shall be protected from rain, condensation, contamination, snow and freezing until dried to the fullest extent practicable.

5.11 Spot repair of damaged primer

a. Where pre-erection/shop primer has been damaged at isolated localized spots during handling and transportation or after erection / welding, its repair shall be done as given below and as per the Table-3 of this specification.

b. Surface preparation: Quickly remove the primer from damaged area by mechanical scraping and emery paper conforming to SSPC-SP-3 to expose the white metal. Blast clean the surface, if possible. Feather the primed surface, over the intact adjacent surface surrounding the damaged area, by emery paper.

Primer shall be applied (as per the applicable design temperature and in conjunction with Table-3) wherever damage was observed on pre-erection / pre fabrication or shop primer.

c. If damaged areas are found to be extensive and spread over large areas (as required by Engineer-in charge), then entire pre-erection/pre-fabrication/shop primer shall be removed by blasting to achieve

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SSPC-SP-10 and entire blasted surface shall be primed again with F-8/ F-9 or F-16, as applicable, for the intended design temperature. (See note of Table-3). If the prepared surface lies adjacent to a sound coated surface, the surface preparation shall overlap the coated surface by at least 50mm. The remainder of existing coated surface shall be properly protected with shields or screens to prevent any possible damage to the coating.

5.12 Equipment:

a. All tools, brushes, rollers, spray guns, blast material, hand power tools for cleaning, all equipment, scaffolding materials, shot & grit blasting equipment, air compressors etc. required shall be suitable for the work and shall be arranged by the CONTRACTOR in sufficient quantity at the site. The manufacturers test certificates ***/*** data sheets for all the above-mentioned items shall be reviewed by Engineer-In-Charge at site before start of the work.

b. All paint spraying equipment, including mixers, shall be thoroughly cleaned before mixing of new materials. All coating materials shall be mixed and thoroughly stirred in accordance with the instructions of the paint Manufacturer. Sufficient agitation to maintain good mixing shall be applied until the product is used. If air is entrapped in the product during mixing/stirring, sufficient time should be allowed for the air bubbles to escape before application. Only thinners specified by the paint Manufacturer shall be used.

5.13 Shop coating

a. Shop coated equipment (coated with primer & finishing coat) should not be repainted unless paint is damaged. Repair of primer shall be carried out as per Table-3 of paint systems depending upon the compatibility of paint. Intermediate and final coats over repaired primer shall be as per applicable tables mentioned in this specification. The recommendations of paint manufacturer's datasheets including maximum overcoat interval shall be followed and recorded in the coating inspection logbook.

c. Shop primed equipment and surfaces will only be 'spot cleaned' in damaged areas by means of power tool brush cleaning or hand tool cleaning and then spot primed before applying one coat of field primer, unless otherwise specified. If shop primer is not compatible with field primer, then shop coated primer should be completely removed before application of selected paint system for a particular environment.

d. For package units/Items/ OEM equipment, shop primer & coating system should be as per the paint system given in this specification. However, manufacturers' standard may be followed after review by EIL but shall adhere to the minimum DFT specified in ISO-12944-5; C5 (Very high durability). For system under insulation, minimum guidelines as per NACE RP 0198 shall be followed.

In this case, guarantee of the coating system lies with package supplier/OEM. EIL's decision in this regard is final and binding on Supplier/Contractor/manufacturer.

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5.14 Guidelines for Documentation / records

a. A written quality plan with procedure for qualification trials and for the actual work including test and inspection plan & procedure for approval before start of work.

b. Daily progress report with details of weather conditions, particular of applications, no. of coats, overcoating intervals, pot life and type of materials applied, anomalies, progress of work versus program.

c. Results of measurement of temperatures, relative humidity, surface profile, film thickness, holiday detection, adhesion tests with signature of appropriate authority.

d. Particulars of surface preparation and paint application during trials and during the work.

e. Details of non-compliance, rejects and repairs.

f. Type of testing equipment and calibration.

g. Code and batch numbers of paint materials used.

Note: The coating applicator must maintain a job record consisting of all the information as per 5.12.b. to 5.12.g above as well as the approved procedure of work (5.12.a. above). The job record consisting of information in accordance to 5.12.b. to 5.12.g shall be entered on daily basis and should be daily signed by Engineer-in-charge. A sample template for daily coating inspection report is given in Annexure-III as reference.

6.0 PAINT MATERIALS

Typical characteristics and codes of various paint materials used in this specification are as follows.

TABLE-2: PAINT MATERIALS
(Refer to general notes at the end of this table)

DESCRIPTION	P-6	P-7	P-4	F9
Technical name	Epoxy Zinc Phosphate Primer	Cold Galvanizing product	Etch Primer/Wash Primer	Inorganic zinc silicate coating
Type and composition	Two component polyamide cured epoxy resin medium, pigmented with zinc phosphate.	One pack synthetic resin-based zinc galvanizing containing min 92% of electrolytic zinc	Two pack polyvinyl butyral resin medium cured with phosphoric acid solution pigmented with zinc tetroxy chromate.	Inorganic zinc silicate Coating containing zinc content min. 80%. Shall pass MEK rub test as per

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		dust of 99.95% purity.		ASTM D4752 with resistance rating >4
Volume solids % Minimum	49	37	9	57
DFT per coat, µ	40-50	40-50	8-10	65-75
Theoretical covering capacity in m^2/coat/ litre	9.8-12.2	3.4-4.4 m^2/kg	9.0-11.2	7.6-8.8
Weight per liter in Kg/litre (min.)	1.4±0.05	2.67 kg at 15°C	1.2±0.05	2.3
Touch dry at 30°C (max.)	30 min.	10 min.	2 hrs.	0.5 hrs.
Hard dry at 30°C (max.), Hrs.	8	24	24	12 hrs.
Over-coating interval, hrs. *Note 11	Min. 8	Min. 4	Min. 4-6	Min. 12 hrs. at 20°C & 50% RH
Pot life at 30°C for two Component paints, hrs.	6 - 8	NA	NA	4-6
Adhesion (ASTM D 4541)	>7	NA	NA	>5
Temperature resistance (min) °C (ASTM D 2485) *Note 8	80 (Method A)	50 (Method A)	NA	400 (Method B)

TABLE- 2: PAINT MATERIALS (Contd.)

DESCRIPTION	F-2	F-3	F-6A/B	F-6C
Technical name	Acrylic Polyurethane finish paint	Chlorinated rubber-based finish paint	Epoxy-High Build coating	Solvent less epoxy coating
Type and composition	Two-pack aliphatic isocynate cured acrylic finish	Single pack Plasticized chlorinated rubber based	F-6A Two-Pack Aromatic polyamine cured epoxy resin medium suitably	Two pack, cured with Amine Adduct;

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	paint (free of alkyd/polyester resins).	medium with chemical and weather resistant pigments.	pigmented. F-6B: polyamide cured epoxy resin medium suitably pigmented.	catalyzed epoxy resin suitably pigmented
Volume Solids % (min.)	40	36	57	98
DFT per coat, µ	30-40	30-40	100-125	300-450
Theoretical covering capacity in m^2/coat/litre	10-13.3	9-12	4.6-5.7	2-3.9
Weight per liter in Kg/litre (min.)	1.15	1.15	1.42	1.40
Touch dry at 30°C (max)	30 min.	30 min.	3 hrs.	3 hrs.
Hard dry at 30°C (max.).	8 hrs.	8 hrs.	16 hrs.	16 hrs.
Full cure at 30°C (for immersion/ high temperature service)	NA	NA	5 days	5 days
Over-coating Interval, hrs. *Note 11	Min.12.	Min. Overnight	Min. Overnight Max. 5 days	Min. 8. Max. 48
Pot life (approx.) at 30°C for two component paints, hrs.	5-8	NA	3-6	0.5
Adhesion (ASTM D 4541)	>5	>4	>7	>8
Abrasion Resistance (ASTM D4060) For 1000 g load	<300 mg /1000 cycles/CS17 or <100 mg /1000 cycles/CS10	NA	NA	NA
Temperature resistance (min.) °C (ASTM D 2485) *Note 8	80 (Method A)	60 (Method A)	80 (Method A)	120 (Method A)

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TABLE- 2: PAINT MATERIALS (Contd.)

DESCRIPTION	F-7	F-8	F-11	F-12	F19
Technical name	High build coal tar epoxy coating.	Self-priming type surface tolerant high build epoxy coating (complete rust control Coating)	Heat resistant synthetic medium based two pack Aluminum Paint suitable up to 250°C dry temp. *Note: 10	Heat resistant silicone Aluminum Paint suitable up to 540°C dry temp.	High build Epoxy Ceramic Filled tank liner Type and composition: High build Epoxy Novolac Ceramic Filled tank liner for sustained immersion service in Hydrocarbon cargoes, refinery distillates, furnace oils etc., kept at elevated
Volume Solids % Minimum.	62	75	35	18	-
DFT per coat in µm	100-125	100-125	15-20	15-20	150-200
Theoretical covering capacity in m^2/coat/ litre	5-6.2	6-7.5	17.5-23.3	9-12	3.5-4.7
Weight per liter in Kg/litre (min.)	1.40	1.41	0.95	1.00	-
Touch dry at 30°C (maximum)	4 hrs.	3 hrs.	3 hrs.	0.5 hrs.	2-3 hrs.
Hard dry at 30°C (maximum),	48 hrs.	24 hrs.	12 hrs	24 hrs.	10 hrs.
Full cure 30^{O}C (for immersion /high Temperature service.)	5 days	5 days	NA	NA	-
Over-coating interval, hrs. *Note 11	Min. 24 hrs Max.5days	Min. 10	Min. 24	Min. 24	Min: 12 Hrs. Max: 3 days

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Pot life at 30°C for two components Paints, hrs.	4-6	1.5	NA	NA	1-2 hrs.
Adhesion MPa (ASTM D 4541)	>5	>5	NA	NA	-
Temperature resistance (min.) °C (ASTM D 2485) *Note 8	80 (Method A)	80 (Method A)	250 (Method A)	540 (Method B)	180 (Method A)

TABLE- 2: PAINT MATERIALS (Contd.)

DESCRIPTION	F-14	F-15	F-16	F-17	F-20
Technical name	Polyamine cured coal tar epoxy	Two-component Epoxy phenolic coating cured with Polyamine adduct hardener	Inert polymeric matrix coating suitable for under insulation for CS and SS.	Novolac epoxy phenolic coating cured with Polyamine adduct hardener	Glass flake reinforced vinyl ester coating.
Type & composition	Specially formulated polyamine cured coal tar epoxy suitable for application under insulation	Two pack ambient temperature curing epoxy phenolic coating system suitable for application under insulation CS/SS piping	Suitable for high temperature service and under insulation coating for CS, alloy steel and SS	Novolac epoxy phenolic coating cured with Polyamine adduct hardener	Two component glass flake filled vinyl ester lining for under immersion services up to 90 deg. C.
Volume Solids % Minimum.	67	67	50	98	98
DFT per coat in microns	100-125	100-125	100-125	300-450	500-600
Theoretical covering capacity in m^2/coat/ litre	5.4-6.7	6.7-8.9	4-5	2.2-3.3	1.6-2

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Weight per liter in Kg/litre (min.)	1.45	1.65	>1.3	1.7	>1.2
Touch dry at 30°C (max)	4 hrs.	3 hrs.	1 hrs.	2 hrs.	2 hrs.
Hard dry at 30°C (max).	24 hrs.	24 hrs.	16 hrs.	24 hrs.	4 hrs.
Full cure 30°C (for immersion / high temp service)	168 hrs (7 days)	168 hrs (7 days)	NA	168 hrs (7 days)	96 hrs (4 days)
Over-coating Interval *Note 11	Min. 6 hrs Max.5 days	Min. 36 hrs Max.21 days	Min.6 hrs Max. Not applicable	Min. 16 hrs Max.21 days	Min. 4 hrs Max.3 days
Pot life at 30°C, hrs (for two component paints)	4	4-6	\ 1	1	50 min-1 hr.
Adhesion, MPa (ASTM D 4541)	>6	>7	NA	>8	>7, Tensile strength >20N/mm2 (ASTM D 638)
Temperature resistance (min.) °C (ASTM D 2485) *Note 8	125 (Method A)	150 (Method A)	650 (Method B)	200 (Method A)	90 (Method A)

General notes for TABLE-2:

1. Covering capacity and DFT achieved per coat depends on method of application. Covering capacity specified above is theoretical. For estimation of actual quantity of paints required, include the losses during application. Minimum specified DFT should be maintained in any case.

2. All primers and finish coats should be ambient temperature curing and air drying unless otherwise specified.

3. All paints shall be applied in accordance with manufacturer's instructions for surface preparation, intervals, curing and application. Wherever a deviation is noticed from the specification in manufacturer data sheet, more stringent one between the data sheet and the specification shall prevail e.g. if this specification recommends Sa 2 ½ and the manufacturer data sheet requires Sa3, the surface preparation shall be done as per Sa 3. However, in another case if this specification

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requires the surface preparation of Sa 2 ½ and the manufacturer data sheet recommends only Sa 2 as minimum, the surface preparation shall be done as per Sa 2 ½.

4. Technical data sheets for all paints shall be supplied at the time of submission of quotations.

5. Internationally recognized & acceptable testing method shall be used for lab testing wherever testing standards are not mentioned.

6. Touch dry, hard dry, pot life, full cure period, & over coating interval shall be as per manufacturer's data sheets and no testing is required. Slight variation in the values of these parameters along with weight per liter may be permissible with the discretion of engineer-in-charge in consultation with EIL-SMMS.

7. Temperature resistance tests (ASTM D2485) shall be carried out for minimum required temperature resistance indicated.

8. Wherever ASTM D 2485 method B is applicable, test results of the panels subjected to salt spray (ASTM B 117) after muffle furnace exposure shall be submitted for pre-qualification purpose.

9. F6-C shall be suitable for drinking water service and should have certification from competent authority.

10. Alkyd type paint system have potential flaking problems and therefore, F11 shall not be alkyd type.

11. Maximum overcoat interval shall be as per Paint manufacturer's datasheet.

7.0 SELECTION OF COATING SYSTEMS

The external coating system for EIL projects should be selected based on the C5 environment (very high durability) as per ISO12944-2, design temperature, involved services of the steel substrate and plant location.

The paint system to be applied for a specific job shall be arrived at sequentially as given below:

a. Identify the environment from area classification details and choose the appropriate table.
b. Identify the design temperature from the technical documents.
c. Identify the specific field paint system and surface preparation requirement from the above identified table and temperature range.
d. Identify the shop priming requirement from based on compatibility of the above paint system.
e. Identify the need of repair of shop primer and execute as per Table-3.

7.1 Classification based on plant location:

a) Plant located in inland area (more than 50 km from coast).

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- For offsite areas and utilities: Table-5 to be followed.

- For process units, DM plant, CPP and Cooling towers, ETP, RWTP: Table-6/7 as applicable to be followed.

b) Plant located on sea coast or within 50 km from sea coast.

- For process units, DM plant, CPP, Cooling tower, ETP, RWTP, offsite & utilities etc.: Table-6/7 as applicable to be followed.

c) For external surface of above ground tanks, Table-8 to be followed for all locations (inland or coastal)

TABLE-3: REPAIR OF PRE-ERECTION/PRE-FABRICATION OR SHOP PRIMER AFTER ERECTION/WELDING

(For all un-insulated CS, LTCS & alloy steel items in all environments)

Sl. No.	Design Temp. in ºC	Surface Preparation	Coating System	Total DFT in Microns (min.)	Remarks
3.1	-45 to 80	SSPC-SP-3	1 coat of F-8 @ 125 µ DFT/coat+ 1 coat of P-6 @ 40 µ DFT/coat	165	See Note-1 below and clause 5.11
3.2	81 to 250	SSPC-SP-11	1 coat of F-9 @ 65-75 µ DFT/coat + 1 coat of F-11 @ 20 µ DFT/coat	85-95	
3.2	251 to 400	SSPC-SP-11	1 coat of F-9 @ 65-75 µ DFT/coat + 1 coat of F-12 @ 20 µ DFT/coat	85-95	
3.3	401 to 550	SSPC-SP-3	1 coat of F-16 @ 125 µ DFT/coat	125	

Note for Table-3:

1. The application and repair of pre-erection/pre-fabrication and shop primer given in above tables shall be done for all the items to be painted. In case the damages of primer are severe and spread over large area as per Engineer In charge discretion, entire primer shall be removed by blasting to achieve SSPC-SP-10 and surfaces shall be suitably primer coated as mentioned in Table 5.0 to Table 18.0. After the repairs of the primer, suitable intermediate and final coats shall be applied as per applicable coating systems mentioned in Table 5.0 to Table 18.0.

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TABLE-4: COATING SYSTEM FOR GALVANIZED ITEMS (Refer clause 2.2.7)

Sl. No.	Design Temp. in °C	Coating System	Total DFT in Microns (min.)	Remarks
4.1	Up to 60	Hot Dip Galvanizing with thickness as per ISO 1461, Surface preparation over galvanization as per SSPC SP 16 & ISO 12944-4; 1 coat of F-6B @ 100µ DFT/coat + 1 coat of F-2 @ 40 microns DFT/coat	140µ of finish coat (excluding the thickness of galvanizing)	Special primers like etch primer (surface preparation) may also be considered for coating on galvanized surfaces

Notes for Table-4:

1. F-6B shall be modified type and suitable for coating over galvanization. Paint suppliers confirmation is mandatory.

2. Repair of the damaged areas of galvanized coatings due to welding during erection shall be carried out as per recommended practice ISO 1461, using cold galvanizing spray process. Organic paint systems are not acceptable for the repair.

3. After repair of damaged galvanized coating by cold galvanization (P-7), the repaired area shall be top coated with paint system as given in table-4 above (i.e. 1 coat of F-6B @ 100µ DFT/coat + 1 coat of F-2 @ 40µ DFT/coat).

4. Galvanized gratings don't require painting in general until otherwise specified elsewhere or as per the requirement of the OWNER. Galvanized items may require painting to meet the colour coding requirement of the OWNER. Contractor has to ensure the applicable colour coding prior to application of coating as per this clause.

TABLE-5: COATING SYSTEMS FOR INLAND PLANTS (OFFSITES & UTLITIES)

(For all new un-insulated above ground CS, LTCS & Alloy steel piping, equipment, structures, valves, Vessels & columns, stacks etc.)

Sl. No.	Design Temp. in °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
			Intermediate Coat	Finish Coat		
5.1	-45 to -15	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/coat	-	-	65-75	a. No over-coating shall be done on

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5.2	-14 to 80	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/coat + 1 coat of P-6 @ 40 µ DFT/ coat	1 coat of F-6B @ 100 µ DFT/coat	1 coat of F-2 @ 40µ DFT/coat	245-255	F-9. b. Surface profile for F-9 shall be 30-40 µm c. F11 shall not be Alkyd type. d. F-12 shall be ambient temperature curing type
5.3	81 to 250	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/coat + 1 coats of F-11 @ 20µ DFT/coat	-	1 coats of F-11 @ 20µ DFT/coat	105-115	
5.4	251 to 400	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/coat + 1 coats of F-12 @ 20µ DFT/coat	-	1 coats of F-12 @ 20µ DFT/coat	105-115	
5.5	401-650	SSPC-SP-10; 1 coat of F-16 @ 125 µ	-	1 coat of F-16 @ 125 µ	250-300	-

TABLE-6: COATING SYSTEMS FOR CORROSIVE AREAS (PROCESS UNITS, COOLING TOWER, DM, CPP, ETP, RWTP etc.)

(For all new un-insulated above ground CS, LTCS & Alloy steel piping, equipment, structures, valves, vessels & columns, furnace stacks etc.)

Sl. No.	Design Temp. °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total DFT in Microns (min.)	Remarks
			Intermediate coat	Finish Coat		
6.1	-45 to -15	SSPC-SP-10; 1coat of F-9 @ 65-75µ	-	-	65-75	a)No over coating on F-9

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6.2	-14 to 80	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/ coat + 1 coat of P-6 @ 40 µ DFT/ coat	2 coats of F-6B @ 100 µ DFT/coat	1 coat of F-2 @ 40µ DFT/coat	345-355	is allowed b) F-12 shall be ambient temperature curing type c) F11 shall not be Alkyd type. d) Surface profile for F-9 shall be 30-40 µm
6.3	81 to 250	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/coat + 1 coats of F-11 @ 20µ DFT/coat	-	1 coat of F-11 @ 20µ DFT/coat	105-115	
6.4	251 to 400	SSPC-SP-10; 1coat of F-9 @ 65-75µ DFT/ coat + 1 coats of F-12 @ 20µ DFT/coat	-	1 coat of F-12 @ 20µ DFT/coat	105-115	
6.5	401-650	SSPC-SP-10; 1 coat of F-16 @ 125 µ	-	1 coat of F-16 @ 125 µ	250-300	-

NOTES for TABLE-5 & TABLE-6:

1. The list of items given in the heading of the above table is not exhaustive. There may be more items for a particular contract where these specifications are used. The CONTRACTOR is fully responsible for completing painting including prefabrication primer for all the items supplied and fabricated as per contract document and scope of work.

2. If the application of pre-erection/pre-fabrication/shop primer has already been completed, the same shall not be repeated in the field. In case the damages to the primer coat are severe and spread over large areas, the Engineer-In-Charge may decide & advise re-blasting and re-application of the primer coat. Repair of pre-fabrication/pre-erection primer, if required, shall be done as per Table-3.

3. Flare line within unit or offsite areas shall be coated as per clause 6.4 of Table-6.

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4. For external surface of RCC Chimney, 2 coats of F-6 B@ 100µ DFT/coat to obtain a total DFT of 200 µ shall be applied after proper surface preparation as per guidelines in clause 4.6. Suitable PU top coat shall also be considered.

5. At the site, shop primer coated prefabricated items/structures/equipment/vessels shall be stored in the shed area and contractor shall brush off any chalking observed with emery paper, prior to application of subsequent coats.

TABLE-7: COATING SYSTEMS FOR EFFLUENT TREATMENT PLANT (ETP) & RODM

Sl. No.	Design Temp. in °C	Surface Preparation	Coating system		Total DFT in Microns (min.)	Remarks
			Primer	Finish Coat		
7.1	For external surfaces of steel items: screens, walk way bridges, clarifier/thickener scrapping mechanism, baffles, Media filters/vessels (PSF, DMF, MMF, & ACF etc.), vertical pumps, CS/MS tanks/ vessels and structures.					
	-14 to 80	SSPS-SP-10	1 coat of F-9 @ 65-75µ DFT/coat + 1 coat of P-6 @ 40 µ DFT/ coat	2 coats of F-6B @100µ DFT/coat + 1 coat of F-2 @ 40µ DFT/coat (2x100+40= 240)	345-355	Note 1
7.2	For internal surfaces of steel items: all effluent handling units such as TPI, DAF, tube settlers, clarifiers, tanks, sludge tanks and sewage tank, wet slop oil tanks etc., scrapping mechanism in clarifier etc.					
	-14 to 80	SSPS-SP-10	1 coat of F-15 @ 100µ DFT/coat.	2 coats of F-15 @100µ DFT/coat (2x100=200)	300	-
7.3	All R.C.C./concrete surfaces exposed to effluent water / liquid such as tanks, structures, drains etc., all effluent handling units such as API, TPI, DAF, tube settlers, clarifiers, tanks, sumps, sludge sumps/tanks and sewage sumps/tank, wet slop oil sump/tanks etc.					
	-14 to 80	As per clause 4.6 of this specification	Epoxy screed lining		3000	Note 1
7.4	Internal surface of equipment like Media filters/vessels (PSF, DMF, MMF, & ACF etc.), activated carbon filters, alkaline, acids & other high corrosive service					
	Up to 90	SSPC-SP-10	1 coat of clear two component solvent free vinyl ester primer @ 100µ DFT/ Coat + 2 coats of F-20 @ 500µ DFT/ Coat		1100	Note-2

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NOTES for TABLE-7:

1. Contractor shall follow manufacturer recommendations to develop epoxy screed lining procedure for EIL review and approval.

2. This coating system is applicable in conjunction with relevant PDS of the equipment.

TABLE-8: EXTERNAL COATING SYSTEMS FOR CARBON STEEL AND LOW ALLOY STEEL STORAGE TANKS
(except for crude tanks. Refer Annexure-II for Crude Oil Tanks painting)

Sl. No.	Design Temp. in °C	Surface Preparation	Coating system (Note-1)		Total DFT in Microns (min.)	Remarks
			Primer	Finish Coat		
8.1	All external surfaces of shell, wind girders, appurtenances, roof tops of all above ground tank including top side of external and internal floating roof and associated external structural works.					
8.1.1	-14 to 80	SSPC-SP-10	1coat of F-9 @ 65-75µ DFT/coat + 1coat of P-6 @ 40µ DFT/ coat	2 coats of F-6B @ 100µ DFT /coat + 1 coat of F-2 @ 40µ DFT/ coat	345-355	
8.1.2	81 to 450	SSPC-SP-10	1coat of F-9 @ 65-75µ DFT/coat	1 coat of F-16 @ 125 µ DFT / coat	190-200	
8.2	External surfaces of bottom plate (in contact with soil) for all storage tanks.					
8.2.1	-14 to 80	SSPC-SP-10	1 coat of F-9 @ 65-75µ DFT/ coat	3 coats of F-7@ 150µ DFT/coat (3x150=450)	515-525	-
8.2.2	81 to 200	SSPC-SP-10	1 coat of F-17 primer @ 400µ DFT/ coat	1 coat of F-17 finish coat @ 400µ DFT/ coat	800-825	Note-4
8.3	For underside of the bottom plate (not in contact with soil) (in case tank is not lifted during PWHT) (Note- 2)					

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8.3.1	-29 to 400	SSPC SP-10	1 coat of F-16 @ 125 µ	2 coat of F-16 @ 125 µ/coat	375	Note-3

Notes for TABLE-8:

1. All paint coating application including primer for tanks shall be carried out at field after erection and completion of entire welding.
2. For underside of bottom plate as per clause no.8.3.1:

a) Painting shall be carried out before laying the bottom plate for tanks with non-Post Weld Heat Treatment (PWHT).

b) For tanks with PWHT, painting shall be carried out after PWHT.

c) In case tank is not lifted during PWHT then painting shall be applied before laying the bottom plate.

3. This coating system is also applicable for temperature ranges not covered in 8.2 above.

4. This coating system is also applicable for bottom plates having MOC as Stainless Steel.

TABLE-9: INTERNAL COATING SYSTEMS FOR CARBON STEEL AND ALLOY STORAGE TANKS
(except for all crude tanks. Refer Annexure-II for Crude Oil Tanks)

Sl. No.	Design Temp. in °C	Surface Preparation	Coating system		Total DFT in Microns (min.)	Remarks
			Primer	Finish Coat		
9.1	Internal surface of cone roof with supporting structures, top shell course for free board height, underside of floating roof, oil side surface of pontoons, support structures and ladders and other CS internals etc., inside of bottom plate, internal surface of bare shell for 1.5 mtr from bottom, for storing petroleum products and intermediates such as Isomerate, Reformate, NHT / CCR / DHT feed, HSD, Gasoline, Naphtha, SKO, MS - Motor Spirits, LCGO, MTBE and Dry Slop.					
9.1.1	-14 to 45	SSPC-SP-10	1 coat of F-9 @ 65-75 µ DFT/coat	-	65-75	-

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9.1.2	46 to 90	SSPC-SP-10	1 coat of F-15 primer @ 100µ DFT/ coat	1 coat of F-15 intermediate coat @ 100µ DFT/coat + 1 coat of F-15 finish coat @ 100µ DFT/ coat	300	-
9.2	Internal surface of cone roof with supporting structures, top shell course for free board height, underside of floating roof, oil side surface of pontoons, support structures and ladders and other CS internals etc., inside of bottom plate, internal surface of bare shell for 1.5 mtr from bottom, for storing petroleum products and intermediates such as VR, VGO, IFO/RFO, HCGO and Black Slop and other high temp. hydrocarbons					
9.2.1	91 to 150	SSPC-SP-10	-	1 coat of F-17 @ 400µ DFT/coat	400	-
9.2.2	151 to 180	SSPC-SP-10	-	3 Coat of F-19 @ 125	375	F-19 shall be suitable for immersion service of the given products
9.3	Amine and Sour water storage tank All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					
9.3.1	up to 90	SSPC-SP-10	1 coat of F-15 primer @ 100µ DFT/ coat	1 coat of F-15 intermediate coat @ 100µ DFT/coat + 1 coat of F-15 finish coat @ 100µ DFT/ coat	300	-
9.4	Potable, Raw, Fire water, De-mineralized (DM) water & Condensates etc. All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					
9.4.1	-14 to 60	SSPC-SP-10	1 Coat of F-6A @ 100µ DFT/coat	1 coat of F-6C @ 300-350 µ DFT/ coat	400-450	-
9.4.2	61 to150	SSPC-SP-10	1 coat of F-15 primer @ 100µ DFT/ coat	1 coat of F-15 intermediate coat @ 100µ DFT/coat + 1 coat of F-15 finish coat @ 100µ DFT/ coat (100+100=200)	300	-
9.5	Hydrochloric acid (HCl) 10 % All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					

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9.5.1	-14 to 60	SSPC-SP-10	1 Coat of clear two component solvent free vinyl ester primer @ 100µ DFT/ Coat	2 Coats of F-20 @ 500µ DFT/ Coat	1100	-
9.6	Aggressive solvents like hexane, hexene, benzene, xylene and toluene etc.: All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					
9.6.1	-14 to 65	SSPC-SP-10	1 coat of F-9 @ 65-75µ DFT/ coat	-	65-75	-
9.7	Ethylene glycol tanks: All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					
9.7.1	All	SSPC-SP-10	-	3 coats of F-17 @ 75µ /Coat; (3x75=225)	225	-
9.8	Inside pontoon and inside of double deck of all floating roofs					
9.8.1	-14 to 80	SSPC-SP-3	1 coat of F-8 @ 100µ DFT/coat	1 coat of F-8 @ 100µ DFT/coat	200	-
9.8.2	81 to150	SSPC-SP-10	1 coat of F-15 primer @ 100µ DFT/ coat	1 coat of F-15 intermediate coat @ 100µ DFT/coat + 1 coat of F-15 finish coat @ 100µ DFT/ coat (100+100=200)	300	-
9.8.3	151 to 200	SSPC-SP-10	-	1 coat of F-17 @ 400µ DFT/coat	400	-
9.9	Alkalis up to 50 % concentration: All internal surfaces but not limited to internal surfaces of shell for full height, bottom plate, accessories, roof and roof structures of cone and dome roof tanks etc.					
9.9.1	Up to 60°C	SSPC-SP-10	1 coat of F-15 primer @ 100µ DFT/ coat	2 Coats of F-6 A @ 100µ DFT/coat (2x100=200)	300	-
9.10	Internal surface of underside of floating roof, bottom plate, complete shell course for full tank height, including immersed gauge pipe, still well etc. and their supporting structure, ladders and other CS internals etc. for storing **ATF-Aviation Turbine Fuel**.					

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9.10.1	Up to 80˚C	SSPC-SP-10	1 coat of primer* @ 75µ DFT/ coat	1 Coats of F-6 C @ 300µ DFT/coat (1x300=300)	375	**Primer shall be compatible with F6C. F6C shall comply with the requirements of EI-standard 1541. Shade of the paint shall be Off-white.**
9.11	Internal surface of underside of fixed roof and supporting structure for internal floating roof tank for storing **ATF-Aviation Turbine Fuel**.					
9.11.1	Up to 80˚C	SSPC-SP-10	1coat of F-9 @ 65-75µ DFT/coat + 1coat of P-6 @ 40µ DFT/ coat	2 coats of F-6A @ 100µ DFT /coat	305	

General Note for Table-9: The list of surfaces to be painted are not exhaustive. All internal surfaces of all type of tanks including structural items shall be coated as per the above table. No CS surface shall be kept un-painted.

TABLE-10: COATING SYSTEMS FOR EXTERNAL SIDE OF UNDERGROUND CARBON STEEL PLANT PIPING AND VESSELS

Sl. No.	Design Temp. in °C	Surface Preparation & Shop Primer	Coating system		Total DFT in Microns (min.)	Remarks
			Surface Preparation & Primer	Finish Coat		
10.1	Underground carbon steel plant piping.					
10.1.1	25 to 80	-	As per document B957-000-06-42-PLS-04	3layer polyethylene (3LPE) coating as per document B957-000-06-42- PLS-04	3.5 mm	--

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10.1.2	81 to 200	-	SSPC-SP-10; 1 coat of F-17 primer @400 µ DFT/ coat	1 coat of F-17 @ 400 DFT/coat	800	-
10.1.3	201 to 400	SSPC-SP -10	1 coat of F-16 primer @125 µ DFT/ coat	2 coats of F-16 @125µ DFT/ coat	375	Note 1
10.2	External side of underground vessels					
10.2.1	-45 to 80	SSPC-SP -10; 1 coat of F-9 @ 65-75µ DFT/ coat + 1 coat of F-7 @ 100µ DFT/coat	-	2 coats of F-7 @ 100µ DFT/coat	365-375	-
10.2.2	81 to 200	SSPC-SP -10	1 coat of F-17 primer @400 µ DFT/ coat	1 coat of F-17 @400µ DFT/ coat	800	-
10.2.3	201 to 400	SSPC-SP -10	1 coat of F-16 primer @125 µ DFT/ coat	2 coats of F-16 @125µ DFT/ coat	375	-

Notes for TABLE-10:

1. Coating system as per Sl. No. 10.1.3 is applicable for underground CBD line subjected to higher temperature (201-400 deg. C) and in cyclic service. Contractor shall submit suitable product datasheet, PTR and test certificate, for EIL review and approval.

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TABLE-11: COATING SYSTEMS FOR UNDER INSULATION (ALL UNIT AREAS & OFFSITES)
(For insulated piping, equipment, storage vessels, tanks, columns etc. of CS, LTCS, Alloy steel, SS, DSS and SDSS in all environments.)

Sl. No.	Design Temp. °C	Surface Preparation & Pre-erection/Shop Primer	Coating system		Total DFT Microns (min.)	Remarks
			Primer	Finish paint		
11.1	Carbon steel, LTCS and Alloy steel Piping, Storage tanks, Vessels, Equipment etc.					
11.1.1	-45 to 125	SSPC-SP-10; 1coat of F-15 @ 100µ DFT/coat	None	2 coats of F-15 @100µ DFT/coat	300	Note 1
11.1.2	126 to 560	SSPC-SP-10; 1 coat of F-16 @ 125µ DFT/coat	None	1 coat F-16 @ 125µ DFT/coat	250	
For Carbon steel, LTCS and Alloy steel Critical equipment like vessels, reactors, columns & equipment						
11.1.3	200-540	Temporary oil based varnish coating to be provided for transport and storage	Thermally Sprayed Aluminium coating (TSAC) Refer ANNEXURE-I			Critical equipment is identified through respective data sheets. Note 4
11.2	Stainless Steel, Duplex Stainless steel, Super Duplex stainless steel & Piping, Tanks, Vessels & Equipment etc.					
11.2.1	-45 to 125	SSPC-SP-16; (15-25µ surface profile) 1 coat of F-15 @100 µ DFT/coat	None	2 coats of F-15 @100µ DFT/coat	300	Note 1
11.2.2	126 to 650	SSPC-SP-16; (15-25µ surface profile) 1 coat of F-16 @125µ DFT/coat	None	1 coat of F-16 @125µ DFT/coat	250	
11.3	Cyclic service of CS, LTCS, SS, DSS, SDSS & Alloy Steels (Note-1)					

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11.3.1	-45 to 150 (Note-1)	SSPC-SP-10 For CS, LTCS & Alloy steel. SSPC-SP-16 for SS; (15-25µ surface profile) 1 coat of F-15 @100 µ DFT/coat	None	2 coats of F-15 @100µ DFT/coat	300	Note-2&3
11.3.2	-180 to 650	SSPC-SP-10 for CS, LTCS & Alloy steel. SSPC-SP-16 for SS (15-25µ surface profile) 1 coat of F-16 @ 125µ DFT/coat	None	1 coat of F-16 @ 125µ DFT/coat	250	

Notes for TABLE 11

1. Coating system for any other design temperature range not covered in Sr. No. 11.1 & Sr. No. 11.2 shall be as per Sr. No. 11.3.2.

2. In case of overlapping of cyclic temperature ranges as mentioned in 11.3.1 and 11.3.2 then clause 11.3.1 shall be followed.

3. Alternatively, for this temperature range, 1 coat of F-17 @ 400 µ is also acceptable.

4. For all insulated CS, LTCS & LAS vessels, reactors, column & equipment, Contractor/supplier shall verify with BPCL/EIL for applicability of TSA as under insulation coating.

General notes for TABLE-11:

1. “Cyclic Service” is characterized by rapid or periodical temperature fluctuation or temperature cycles or as defined in the process datasheet.

2. The blasting abrasives for SS and alloy steels shall be aluminum oxide or garnet only.

3. The coating system applicable for any other temperature range shall be reviewed if it is encountered.

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TABLE-12: INTERNAL COATING SYSTEMS FOR WATER SIDE COMPONENTS OF CS, SS, DSS & NON-FERROUS HEAT EXCHANGERS

Sl. No.	Design Temp. in °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
			Primer	Finish paint		
12.1	Up to 80	SSPC-SP-10 for CS and SSPC-SP-16 for SS	1 coat of F-15 @ 100 µ DFT/coat	2 coats of F-15 @ 100 µ DFT/coat	300	-
12.2	81 to 200	SSPC-SP-10 for CS and SSPC-SP-16 for SS	-	2 coats of F-17@ 400µ/coat	800	-

Note for Table-12:

1. Coating systems are applicable as per requirement specified in the data sheets of the respective exchangers or equipment.

TABLE-13: COATING SYSTEMS FOR CORROSIVE AREAS - BROWN FIELD PAINTING (REVAMP, REFURBISHMENT AND MAINTENANCE)

(For all existing un-insulated above ground CS, LTCS & Alloy steel piping, equipment, structures, valves, vessels & columns, furnace stacks etc.)

Sl. No.	Design Temp. °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total DFT in Microns (min.)	Remarks
			Intermediate Coat	Finish Coat		
13.1	-45 to -15	SSPC-SP-3; 1coat of F-8 @ 100µ	-	-	100	-
13.2	-14 to 80	SSPC-SP-3; 1coat of F-8 @ 100µ DFT/ coat	2 coats of F-6B @ 100 µ DFT/coat	1 coat of F-2 @ 40µ DFT/coat	340	
13.3	81-650	SSPC-SP-3; 1 coat of F-16 @ 125 µ	-	1 coat of F-16 @ 125 µ	250-300	-

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TABLE-14: EXTERNAL AND INTERNAL COATING SYSTEM FOR CRUDE OIL TANKS PAINTINGS (REFER ANNEXURE-II)

TABLE-15: COATING SYSTEMS FOR GI TOWERS

Sl. No.	Design Temp. in °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
			Primer	Finish paint		
15.1	Up to 80	SSPC-SP-3	1 coat of F-8 @ 100 µ DFT/coat	1 coats of F-2@ 40 µ DFT/coat	140	Shade shall be as per defense requirement.

TABLE-16: COATING SYSTEMS FOR STREET POLES

Sl. No.	Description	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
			Primer	Finish paint		
16.1	Street Light Poles	SSPC-SP-3	1 coat of P-6 @ 40 µ DFT/coat	2 coats of F-2@ 40 µ DFT/coat	120	-

Note for Table-15 & 16:

1. For revamp and refurbishment, surface preparation shall be SSPC-SP3 and coating system shall be same as mentioned in Table 15 & 16.

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TABLE-17: COATING SYSTEMS FOR PSV

Sl. No.	Description	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
			Primer	Finish paint		
17.1	PSV, PRV, PV, RV, TRV	SSPC-SP10/SP-3	1 coat of F-8 @ 100 µ DFT/coat	1 coats of F-2@ 40 µ DFT/coat	140	- LPG service: RAL 5013 (cobalt blue) - Conventional type: RAL 3024 (Luminous Red) - Bellow Type: RAL 1026 (Luminous yellow color)

TABLE-18: TEMPERATURE INDICATING PAINT

Sl. No.	Description	Max Temp °C	Surface Preparation & Pre-erection/Shop Primer	Coating System		Total Final DFT in Microns (min.)	Remarks
				Primer	Finish paint		
18.1	Cold Collector, Transfer line, TPR & PG boiler inlet channel at HGU	400	Note-1				

Notes for TABLE-18:

1. Contractor shall propose suitable product for the temperature indicative paint application in the given temperature range, and submit their datasheet, Past Track Record and test certificate, for EIL review and approval.

GENERAL NOTES FOR TABLE: 5 TO 18

1. For uninsulated or insulated items, scope of surface preparation, application of primers to finish coat including repair shall be as per applicable contractual documents like SOR, MR, and PR etc. The list of items is not exhaustive.

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2. At the site, shop primer coated prefabricated items/structures/equipment/vessels shall be stored in the shed area and contractor shall brush off any chalking observed with emery paper, prior to application of subsequent coats.

8.0 GUIDELINES FOR STORAGE & HANDLING

8.1 All paints and painting materials shall be stored in rooms only which are to be arranged by CONTRACTOR and approved by Engineer-In-Charge for the purpose. All necessary precautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent building. A signboard bearing the word "PAINT STORAGE- NO NAKED LIGHT-HIGHLY INFLAMMABLE" shall be clearly displayed outside. Manufacturers' recommendation /Materials safety datasheet shall be followed for storage and handling of paint materials.

Note: This standard doesn't address all the safety concerns if any, associated with its use. It is responsibility of the user of this specification to establish appropriate safety and health practice and determine the applicability of regulatory limitations prior to use.

9.0 COLOUR CODE, IDENTIFICATION AND MARKING

9.1 For identification of pipelines, the following color-coding scheme shall be followed (except for ATF)

TABLE-19: COLOR CODING

SR. No.	SERVICE	RECOMMENDED COLOUR FOR PAINT SYSTEM	RAL COLOUR CODE	
			BASE COLOUR	BAND COLOUR
HYDROCARBON LINES (UNINSULATED)				
1	CRUDE SOUR	Basalt Grey with 1 deep orange band	7012	2011
2	CRUDE SWEET	Basalt Grey with 1 signal red band	7012	3001
3	LUBE OILS	Basalt Grey with 1 grass green band	7012	6010
4	FLARE LINES	White Aluminum	9006	
5	LPG	Deep Orange with 1 oxide red band	2011	3009
6	PROPYLENE	Deep Orange with 2 Cobalt blue bands	2011	5013
7	NAPTHA	Deep Orange with 1 grass green band	2011	6010
8	M.S.	Deep Orange with 1 Basalt Grey band	2011	7012

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9	AV. GASOLINE (96 RON)	Deep Orange with 1 band each of grass green, white and signal red bands	2011	6010	9010	3001
10	GASOLINE (regular, leaded)	Deep Orange with 1 Jet black band	2011		9005	
11	GASOLINE (premium, leaded)	Deep Orange with 1 Cobalt blue band	2011		5013	
12	GASOLINE (white)	Deep Orange with 1 white band	2011		9010	
13	GASOLINE (Aviation 100/130)	Deep Orange with 1 signal red band	2011		3001	
14	GASOLINE (Aviation 115/145)	Deep Orange with 1 traffic purple band	2011		4006	
15	N-PENTANE	Deep Orange with 2 Cobalt blue bands	2011		5013	
16	DIESEL OIL (White)	Oxide red with 1 white band	3009		9010	
17	DIESEL OIL (Black)	Oxide red with 1 traffic yellow band	3009		1023	
18	KEROSENE	Oxide red with 1 grass green band	3009		6010	
19	HY. KEROSENE	Oxide red with 2 grass green bands	3009		6010	
20	DISUFIDE OIL (EX-MEROX)	Oxide red with 1 jet black band	3009		9005	
21	M.T.O	Oxide red with 3 grass green bands	3009		6010	
22	DHPPA	Oxide red with 2 white bands	3009		9010	
23	FLUSHING OIL	Oxide red with 2 jet black bands	3009		9005	
24	LAB FS	Oxide red with 2 Basalt Grey bands	3009		7012	
25	LAB RS	Oxide red with 3 Basalt Grey bands	3009		7012	
26	LAB (Off. Spec)	Oxide red with 1 light grey band	3009		7035	
27	N-PARAFFIN	Oxide red with 1 Cobalt blue band	3009		5013	
28	HEAVY ALKYLATE	Oxide red with signal red band	3009		3001	
29	BLOW DOWN, VAPOR LINE	Off white / Aluminum with 1-Brown band	9006		8004	
30	BLOWDOWN	Off white / Aluminum with 2 copper brown bands	9006		8004	
32	TOULENE	Clay Brown with 1 traffic yellow band	8003		1023	
33	BENZENE	Clay Brown with 1 grass green band	8003		6010	
34	LAB PRODUCT	Clay Brown with 1 Cobalt blue band	8003		5013	
35	FUEL OIL	Jet Black with 1 traffic yellow band	9005		1023	

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36	FULE OIL (Aromatic rich)	Jet Black with 2 traffic yellow bands	9005	1023
37	ASPHALT	Jet Black with 1 white band	9005	9010
38	SLOP AND WASTE OILS	Jet Black with 1 deep orange band	9005	2011
39	SLOP AROMATICS	Jet Black with 2 deep orange bands	9005	2011
CHEMICAL LINES				
40	TRI-SODIUM PHOSPHATE	Lemon Yellow with 1 violet blue band	1012	5000
41	CAUSTIC SODA	Lemon Yellow with 1 jet black band	1012	9005
42	SODIUM CHLORIDE	Lemon Yellow with 1 white band	1012	9010
43	AMMONIA	Lemon Yellow with 1 Cobalt blue band	1012	5013
44	CORROSION INHIBITOR	Lemon Yellow with 1 Aluminum band	1012	9006
45	HEXAMETA PHOSPHATE	Lemon Yellow with 2 jet black bands	1012	9005
46	ACID LINES	Golden Yellow with 1 signal red band	1004	3001
47	RICH AMINE	Lemon Yellow with 2 Cobalt blue bands	1012	5013
48	LEAN AMINE	Lemon Yellow with 3 Cobalt blue bands	1012	5013
49	SOLVENT	Lemon Yellow with 1 grass green band	1012	6010
50	LCS	Lemon Yellow with 1 Blue Grey	1012	7031
WATER LINES				
51	RAW WATER	Yellow Green with 1 jet black band	6018	9005
52	INDUSTRIAL WATER	Yellow Green with 2 signal red band	6018	3001
53	TREATED WATER	Yellow Green with 1 oxide red band	6018	3009
54	DRINKING WATER	Yellow Green with 1 grass green band	6018	6010
55	COOLING WATER	Yellow Green with 1 light brown band	6018	1011

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56	SERVICE WATER	Yellow Green with 1 signal red brown	6018	3001
57	TEMPERED WATER	Yellow Green with 2 grass green bands	6018	6010
58	DM WATER	Yellow Green with 1 aluminum band	6018	9006
59	DM WATER ABOVE 150°F	Yellow Green with 2 jet black bands	6018	9005
60	SOUR WATER	Yellow Green with 2 traffic yellow bands	6018	1023
61	STRIPPED WATER	Yellow Green with 2 Cobalt blue bands	6018	5013
62	ETP TREATED WATER	Yellow Green with 2 oxide red bands	6018	3009
FIRE PROTECTION SYSTEM (ABOVE GROUND)				
63	FIRE WATER FOAM & EXTINGUISHERS	Carmine Red	3002	
AIR & OTHER GAS LINES (UNINSULATED)				
64	SERVICE AIR	Sky blue with 1 signal red band	5015	3001
65	INSTRUMENT AIR	Sky blue with 1 jet black band	5015	9005
66	NITROGEN	Lemon Yellow with 1 deep orange band	1012	2011
67	FREON	Yellow green with 1 traffic yellow band	6018	1023
68	CHLORINE	Lemon Yellow with 1 oxide red band	1012	3009
69	SO_2	Lemon Yellow with 2 white bands	1012	9010
70	H_2S	Deep Orange with 2 oxide red bands	2011	3009
71	GAS (Fuel)	Deep Orange with 1 aluminum band	2011	9006
72	GAS (Sour)	Deep Orange with 2 aluminum bands	2011	9006
73	GAS (Sweet)	Deep Orange with 2 signal red band	2011	3001
74	HYDROGEN	Deep Orange with 1 Pale green band	2011	6021

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STEAM AND CONDENSATE LINES (UNINSULATED)				
75	HP STEAM	White Aluminum with 1 traffic yellow band	9006	1023
76	MP STEAM	White Aluminum with 1 signal red band	9006	3001
77	MLP STEAM	White Aluminum with 1 orange band	9006	2011
78	LP STEAM	White Aluminum with 1 light green band	9006	6021
79	CONDENSATE	Yellow green with 1 white band	6018	9010
80	CONDENSATE ABOVE 150°F	Yellow green with 3 oxide red band	6018	3009
81	BFW	Yellow green with 2 signal red bands	6018	3001
Note: For all insulated steam lines, the colour coding shall be followed as given for un-insulated lines with the specified length of colour bands.				
INSULATED HYDROCARBON PIPING				
82	IFO SUPPLY	Jet Black ground colour with 1 traffic yellow band in centre	9005	1023
83	IFO RETURN	Jet Black ground colour with 1 grass green band in centre	9005	6010
84	HPS	Jet Black ground colour with 1 signal red band in centre	9005	3001
85	BITUMEN	Jet Black ground colour with 2 signal red bands in centre	9005	3001
86	CLO	Jet Black ground colour with 1 brown band in centre	9005	8004
87	VB TAR	Black ground colour with 2 copper brown bands in centre	9005	8004
88	VR AM (BITUMEN / VBU FEED)	Jet Black ground colour with 1 Cobalt blue band in centre	9005	5013
89	VR BH	Black ground colour with 2 Cobalt blue bands in centre	9005	5013
90	VAC. SLOP	Black ground colour with 1 white band in centre	9005	9010
91	SLOP	Black ground colour with 1 deep orange band in centre	9005	2011
92	CRUDE SWEET	Basalt Grey ground colour with 1 signal red band in centre	7012	3001

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93	CRUDE SOUR	Basalt Grey ground colour with 1 deep orange band in centre	7012	2011
94	VGO / HCU	Oxide red ground colour with 2 iron grey bands in centre	3009	7011
95	OHCU BOTOM / FCCU FEED	Oxide red ground colour with 2 iron grey bands in centre	3009	7011
UNINSULATED EQUIPMENT, TANKS AND STRUCTURES				
96	HEATER STRUCTURE	Iron grey	7011	
97	HEATER CASING	White Aluminum	9006	
98	VESSELS & COLUMNS	White Aluminum	9006	
99	HYDROGEN BULLETS	Antique Pink	3014	
100	LPG VESSELS	Oxide red	3009	
101	SO_2 VESSEL	Lemon Yellow	1012	
102	HEAT EXCHANGER	White Aluminum	9006	
103	FO TANK AND HOT TANKS	Jet Black	9005	
104	ALL OTHER TANKS *Note 2	Pure White	9010	
105	CAUSTIC / AMINE / ACID TANKS	Golden yellow	1004	
106	SOUR WATER	Sky Blue		
107	OUTER SURFACE IN BOILER HOUSE	Aluminum	9006	
108	COMPRESSORS AND BLOWERS	Basalt Grey	7012	
109	PUMPS	Pigeon Blue	5014	
110	MOTORS & SWITCH GEAR	Pastel Blue	5024	
111	HAND RAILING	Signal red	3001	
112	STAIRCASE, LADDER AND WALKWAYS	Jet Black	9005	
113	LOAD LIFTING EQUIPMENT AND MONORAILS ETC	Clay Brown	8003	
114	GENERAL STRUCTURE	Steel blue (equivalent to British Airways Blue as per British Standard)	5011	
115	FLUE GAS STACK	Jet Black	9005	

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PIPES AND FITTINGS OF ALLOY STEEL AND SS MATERIAL IN STORE				
115	IBR	Signal red	3001	
116	9Cr-1Mo	Pale Green	6021	
117	5Cr-0.5Mo	Light Blue	5012	
118	$2_{1/4}$Cr-1 Mo	Luminous Yellow	1026	
119	$1_{1/4}$Cr-½ Mo	Traffic Yellow	1023	
120	SS-304	Grey Blue	5008	
121	SS-316	Blue Lilac	4005	
122	SS-321	Pigeon Blue	5014	
SAFETY COLOUR SCHEMES				
123	DANGEROUS OBSTRUCTION	Jet Black and Briht Red Orange band	9005	2008
124	DANGEROUS OR EXPOSED PARTS OF MACHINERY	Bright Red Orange	2008	

Note for Table-19:

1. As per latest DGCA guide line for ATF service color coding shall be Leaf Brown with two black bands.

2. Sr. no 104 - “All other tanks” having pure white (RAL 9010) as top coat shall have intermediate coat in colour: Signal white (RAL 9003) or Traffic White (RAL- 9016) to have lighter intermediate coat.

9.2 Ground Color

The system of colour coding consists of a ground colour and secondary colour bands superimposed over the ground colour. The ground colour identifies the basic nature of the service and secondary colour band over the ground colour distinguishes the particular service. The ground colour shall be applied over the entire length of the un-insulated pipes. For insulated lines, ground colour shall be provided as per specified length and interval to identify the basic nature of service and secondary colour bands to be painted on this specified length to identify the particular service. Above colour code is applicable for both unit and offsite pipelines.

9.3 Color band & Identification lettering (except for ATF service)

For ATF service, 2 color bands of 100 mm with 50 mm gap in between them shall be provided.

The following specifications of color bands shall be followed for identifying the piping contents, size and location of bands & letters. The bandwidth and size of letters in legends will depend to some

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extent upon the pipe diameter. Either white or black letters are selected to provide maximum contrast to the band color. Bands are spaced 25 mm apart when two bands are employed.

Outside dia of pipe or covering in mm	Width of color band in mm
19-32	200
38-51	200
64-150	300
200-250	600
Over 250	800

In addition, ground colour as per specified length should be provided on insulated piping for easy identification of nature of fluid, on which the colour bands should be painted for identification of each service. The length of the ground colour should be 3 times the width of normal band or 2 meters, whichever is suitable depending on the length of the pipe.

Size of letters stenciled/ written for equipment shall be as given below:

Column and vessel: 150 mm (Height)

Pump, compressor and other machinery: 50 mm (Height)

9.3.1 Color band

In addition, the contents of the pipe and/or direction of flow may be further indicated by arrows and legend. If a hazard is involved it must be identified clearly by legend.

The location and size of bands, as recommended, when used, shall be applied to the pipe.

• On both sides of the valves, tees and other fittings of importance.

• Where the pipe enters and emerges from walls and where it emerges from road & walkway overpasses, unit battery limits.

• At uniform intervals along long sections of the pipe.

• Adjacent to tanks, vessels, and pumps.

9.3.2 Color band specification

The location and size of bands, as recommended, when used, shall be applied to the pipe.

• Unit Area: Bands at intervals of 6.0 meters.

• Offsite Area: Bands at intervals of 10.0 meters.

• Each pipe segment will have minimum one band indication, irrespective of length.

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- The bands shall also be displayed near walkways, both sides of culverts, tanks dykes, tanks, vessels, suction and discharge of pumps/ compressors, unit battery limit, near valves of line, etc.

9.3.3 For piping, writing of name of service and direction of flow for all the lines shall be done at following locations

• The letters will be in black on pipes painted with light shade colors and white on pipes painted with dark shade colors to give good contrast.

• Only writing of service name shall be done on stainless steel lines. Precautions should be taken while painting by using low chloride content painting to avoid any damage to the stainless-steel pipes. It is preferable to use adhesive plastic tapes to protect stainless steel pipes.

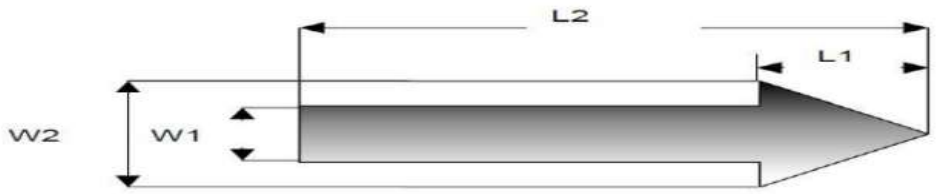
Size of Lettering and Direction Arrow shall be as follows:

Lettering

Pipe diameter	Width x Height- spacing
2" to 6" inclusive	30 x 30mm - 10 mm min.
6" to 50" inclusive	80 x 80mm - 25 mm min.
Greater than 50"	100 x 100mm - 30 mm min.

Direction arrow

Pipe Diameter	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)
2" to 6" inclusive	10	30	45	135
6"to50" inclusive	40	80	90	270
Greater than 50"	50	100	150	450



10.0 QUALITY CONTROL, INSPECTION AND TESTING

10.1 All painting materials including primers and thinners brought to site by CONTRACTOR for application shall be procured directly from manufactures as per specifications and shall be accompanied by manufacturers' test certificates. Paint formulations without certificates are not acceptable (see section 12.0 & 13.0).

10.2 The CONTRACTOR must produce test certificate from pre-qualified paint manufacturer for various tests as detailed out in section 15.0 of this document. The Engineer-In-Charge, in consultation with SMMS, shall have the right to test wet samples of paint at random for verifying quality of paint supplied.

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CONTRACTOR shall arrange to have such tests, as instructed, performed at his cost at any one of the NABL accredited laboratories under a TPI agency.

Samples for the test will be drawn at random in presence Engineer-In-Charge or his representations. Following tests to be carried out if called:

a. Specific Gravity
b. % solids by weight (% zinc content in case of inorganic or organic zinc primer)
c. Drying time (touch dry & full curing)
d. Adhesion test on a test panel prepared at the site (ASTM D 6677).

Test methods for above tests shall be as per relevant ASTM or ISO Standard.

10.3 The painting work shall be subject to inspection by Engineer-In-Charge at all times. In particular, following stage-wise inspection will be performed and CONTRACTOR shall offer the work for inspection and approval of every stage before proceeding with the next stage. The record of inspection shall be maintained in the registers. Stages of inspection are as follows:

a. Surface preparation
b. Primer application
c. Each coat of paint

10.3.1 Following tests are to be carried out during surface preparation:

a. Test for presence of oil/grease and contamination

The steel substrate after degreasing as per SSPC-SP-1 shall be tested as per following procedure to validate absence of oil and grease contamination:

- Visual inspection - continue degreasing until all visible signs of contamination are removed.

- Conduct a solvent evaporation test by applying several drops or a small splash of residue-free tri-chloromethane on the suspect area especially pitting, crevice corrosion areas or depressed areas. An evaporation ring formation is indicative of oil and grease contamination. Continue degreasing and inspection till test is passed.

b. **Tests for surface finish of blasted surface** shall be done by visual inspection using SSPC-VIS1. Clear cellophane tape test as per ISO 8502-3 shall be used to confirm absence of dust on blasted surface. Checks shall be done on each component at least once per 200 m^2 of blasted surface and a minimum of 3 checks per shift.

c. **Test for presence of soluble salt** as per method ISO 8502-9. Maximum allowable salt content shall be considered 20 mg/m^2.Checks shall be done on each component at least once per 200 m^2 of blasted surface and minimum of 3 checks per shift. In case salt exceeds specified limit,

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the contaminated surface shall be cleaned by method as per Annexure-C of ISO 12944-4 (water cleaning). After cleaning, surface shall be retested for salt after drying.

d. **Blast Profile Measurement**: (In-Process testing during actual production before application coating). The angular profile depth measurement shall be done by profile tape as per method ASTM D 4417 method B (Profile depth gauge micrometer)/ calibrated Digital gauge meter. Spot measurement shall be carried out every 15m^2 of blasted surface. At each spot three measurements shall be taken over an area of 10 m^2 and average of measurements to be recorded and reported. If profile is less than specified range, blasting shall continue till greater specified depth profile is achieved.

e. **Tests for blasting media:** Blasting Media (For every fresh batch of media and one random test during blasting)**.** Blasting Media shall be visually inspected for absence of contamination and debris using 10 X magnification.

- Inspection for the absence of oil contamination shall be conducted using following procedure:
  - Fill a small clean 200 ml bottle half full of abrasive.
  - Fill the bottle with potable water, cap and shake the bottle.
  - Inspect water for oil film/slick. If present, the blasting media is not to be used.

- Soluble salt contamination if suspected shall be verified by method ASTM D 4940. If present, media to be replaced.

- Clean blasting equipment, especially pot and hoses, and then replace blasting media and retest.

f. **Test for Blasting Air** (Once Daily before start of blasting and once at random during Blasting). The air for blasting shall be free from moisture and oil. The compressor air shall be checked for oil and water contamination per ASTM D 4285.

In addition to above, record should include type of shop primer already applied on equipment e.g. zinc silicate or zinc rich epoxy or zinc phosphate. Any defect noticed during the various stages of inspection shall be rectified by the CONTRACTOR to the entire satisfaction of Engineer-In-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work, CONTRACTOR shall be responsible for rectifying any defects found during final inspection/guarantee period/defect liability period as defined in general conditions of the contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to OWNER, the extra coat should have prior approval of Engineer-in-charge.

10.4 Final inspection of finished coating shall consist of the following:

Coating DFT & WFT check: DFT measurement shall be as per ISO 2808. Type-II electronic gauge shall be used as described in ASTM D7091. DFT gauge calibration, adjustment of gauge coating thickness, frequency and number of coating thickness measurement shall be as per ASTM D7091

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and SSPC-PA2. Measured DFT shall have a tolerance as per SSPC-PA-2 level-3 of the dry film thickness, specified in this specification. Once in every layer of coating application, spot checks of WFT shall be carried out during the coating application according to ISO 2808, Method No. 1A- comb gauge. This is to ensure that film thickness is being achieved as per the specification. The frequency of WFT check shall be one per 10 m^2.

Adhesion testing: Adhesion of the primer to the steel substrate and inter-coat adhesion of the subsequent coat(s) after curing for at least a week after application of the topcoat shall be examined by a knife test in accordance with ASTM D6677. For the knife test, if the rating is better than 8, the adhesion is considered acceptable. The adhesion is destructive and tested areas shall be repaired afterward using the spot repair procedure. Alternatively, the applicator may perform the adhesion test on a steel panel coated using the same surface preparation and coating application procedure as the work piece. Adhesion testing shall be carried out for each component at least once per 200 m^2 of coated surface.

Holiday detection check: Holiday testing of non-conductive coatings shall be carried out in accordance with NACE SP0188. For immersion, buried & under insulation services, 100% of coated area shall be inspected for holidays. For atmospheric exposure, 10% of coated area which must include weld seams, corners and edges to be holiday tested. Voltage at which test is to be carried out will depend upon DFT of coating being tested and shall be as per NACE SP0188. Any holiday is unacceptable and should be marked and repaired immediately**.**

The CONTRACTOR shall arrange for spot checking of paint materials for specific gravity, glow time (ford cup) and spreading rate.

11.0 PAINT MATERIAL GUARANTEE CERTIFICATE

The CONTRACTOR shall guarantee that the chemical and physical properties of paint materials used are in accordance with the specifications contained herein/to be provided during execution of work and shall submit necessary certificate of the paint material.

12.0 QUALIFICATION CRITERIA OF PAINTING CONTRACTOR/SUB-CONTRACTOR

Painting CONTRACTOR who is awarded any job for EIL, Projects under this standard must have necessary equipment, machinery, tools and tackles for surface preparation, paint application and inspection. The CONTRACTOR must have qualified, trained and experienced surface preparator, paint applicator, inspector and supervisors. The CONTRACTOR supervisor, inspector, surface preparator and paint applicator must be conversant with the standards referred in this specification.

13.0 PRE-QUALIFICATION/ACCEPTANCE CRITERIA FOR PAINT COATING SYSTEM

13.1 Pre-qualification of paint coating manufacturer and their products

Paint manufacturer meeting the following requirements shall be considered by the CONTRACTOR for supply of the paint products.

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a) Manufacturer should have been in continuous business of paint coating formulation and manufacturer for at least past 5 years.
b) Manufacturer should possess past experience of supplying products to hydrocarbon, petrochemical, fertilizer, chemical processing, offshore or heavy industry in the past 5 years.

c) Coating manufacturer should have supplied at least 10000 litre of an individual product to hydrocarbon, petrochemical, fertilizer, chemical processing, offshore or heavy industry.

d) The manufacturer's manufacturing procedure & QA/QC system shall meet ISO 9001 requirements and preferably should possess ISO 14000 certificate.

e) The Quality control set up should be manned by qualified paint technologists whose biodata should be sent along with quality control organization chart.

The Past Track record of the manufacturers as mentioned above shall be substantiated by providing relevant documents to EIL-SMMS for their review and acceptance. This shall include Work Orders, Purchase orders and ISO 9001 certification covering all the requirements mentioned from bullets a) to e) above.

CONTRACTOR shall procure the paint materials from the qualified manufacturer meeting above requirements and after obtaining prequalification testing approval as per requirements mentioned in clause 15.2 below.

13.2 Pre-Qualification Testing procedure:

The paint manufacturer engaged by the mechanical contractor shall carry out the tests in NABL accredited government laboratories or in suggested list of laboratories below, as a part of qualification. Paint manufacturer shall provide the paint samples to laboratory for testing of the parameters mentioned in Table-2 (typical characteristics) and Table-20 (tests on coating systems) of this specification. The testing laboratory will confirm the compliance of the paint material with respect to the acceptance criteria mentioned in the respective tables.

Colored photographs of coated test panels should be taken before and after the test and should be enclosed along with test report. Contractor shall furnish these test certificates along with all necessary supporting documents/information to EIL-SMMS for approval/ acceptance. The paint manufacturer will be qualified and approved by EIL-SMMS for supply of paints after review/assessment of the submissions made by the contractor. Test certificates which are more than 3 years old will not be considered. Paint manufacturers are advised to carryout pre-qualification testing accordingly for paints supply to EIL projects.

List of suggested laboratories:

1. National Test house – Kolkata
2. National Test house-Mumbai

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3. HBTU- Kanpur
4. GIRDA (Gujarat Industrial Research & Development Agency)- Vadodara
5. Indian institute of chemical technology – Hyderabad
6. RITES – Kolkata
7. ICT- Mumbai

TABLE-20: PRE-QUALIFICATION TESTING

SYSTEM No.	COATING SYSTEM	REFERENCE CLAUSE (from table-3 to 12)	TOTAL DFT µ (min)
1.	F-9+P6+F6B+F2	6.2	345
2.	F9+F12+F12	6.4	105
3.	F9+F11+F11	6.3	105
4.	F15+F15+F15	11.1.1	240
5.	F16+F16	8.3.1	250
6.	F17	9.2.1	400
7.	F8	3.1	125
8.	F20+F20	9.5.1	1100
9.	F6C+ F6C + F6C	Annexure II	675
10.	F9+F7+F7+F7	10.2.1	365
11.	F15+F6A+F6A	9.9.1	280
12.	F19+F19+F19	9.2.2	375

S. No.	TEST	FOR SYSTEM NUMBER	DURATION	ACCEPTANCE CRITERIA
1.	Cyclic Test Salt Spray : 72 hrs. Drying in air: 16 hrs. UV-A340 nm weather meter: 80 hrs. One cycle: 168 hrs. (25 cycles at 168 hrs. each cycle) (ASTM D5894)	1	4200 hrs.	Shall pass. No chalking, cracking, flaking, blistering or peeling shall be observed.
2.	Chemical Resistance Test (ASTM D543)			
2a.	10% & 40% NaOH	4, 6, 8, 10 11 & 12	1000 hrs.	Shall pass. No cracking, discoloration, blistering, peeling or softening of film shall be observed.
2b.	5% H2SO4		168 hrs.	
2c.	Xylene		4 weeks	
2d.	Acetone		4 weeks	

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2e.	Ethanol		4 weeks	
2f.	Kerosene		4 weeks	
2g.	Sea water		2000 hrs.	
3.	Immersion in DM/DI water @90^0 (ASTM C868)	4, 6, 8, 10 11 & 12	30 days	No softening, blistering or film damage.
4.	Resistance to DM water using water immersion. (ASTM D870)	9	2000 hrs.	Shall pass. No chalking, cracking, flaking, blistering or peeling.
5.	100% Humidity Test (ASTM D2247)	1 to 12 (except system-2 & 3)	1440 hrs.	Shall pass
6.	Thermal Shock Resistance Test; 5 cycles @ 30 minutes in furnace at 120 ° C and 15 minutes in water after quenching in water for each cycle. (ASTM D2485 method A)	2, 3, 5, & 11 (For system-2, testing to be done after heating the panels at 400°C for 2 hrs.) & (For system-3, testing to be done after heating the panels at 250°C for 2 hrs.)	-	Shall pass
7.	Cathodic Disbondment Test (ASTM G42 @80°C)	4, 5, 10, 6 & 11	-	Diameter of cathodic

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				Disbondment < 10 mm with 6 mm diameter artificial holiday.
8.	Assessment of Adhesion and artificial ageing as per ISO 19277	4, 5, 6, 7, 11 & 12	-	Shall Pass

Each coating product to be qualified shall be identified by the Specific gravity of base and curing agent (ISO 2811). The identification shall be carried out on the batch, which is used for the pre-qualification testing.

13.3 Information to be furnished during delivery of paint materials:

CONTRACTOR along with delivery of paint material has to furnish following information from paint manufacturer to EIL for acceptance/approval of products:

a) Batch test certificates:

Along with paint products delivery to site from the pre-qualified coating manufacturer, CONTRACTOR has to produce test certificate (from paint manufacturer) for each category of product for the following test items. All test results must mention clearly the batch no. and category of product tested. Tests to be conducted for following properties:

- Specific Gravity
- % solids by weight (% zinc content in case of inorganic or organic zinc primer) ~ ASTM D521.

b) Product information sheet/ technical data sheet for each category of product.
The contractor shall be fully responsible for the quality of the paints products as per prequalification testing. After the paint materials are supplied to site, the supplier shall organize random sampling and testing in a NABL laboratory as per discretion of the Engineer-in-charge in consultation with SMMS. Failing to meet the specified quality requirements may cause rejection of the paint products.

c) Remaining Shelf life shall be at least 50% of the total duration at the time of above application of procured material by contractor / owner. However, it is preferred to have the materials from the fresh stock for better performance of coatings.

14.0 METHOD OF SAMPLING & DISPATCH FOR LABORATORY TESTING

(Pre-Qualification tests (sec. 13.2), Batch testing (sec. 13.3) and Inspection testing (sec. 10.0))

14.1 Samples of coating materials should be submitted to the laboratory in sealed containers with batch no. and test certificate on regular format of manufacturer's testing laboratory.

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14.2 All test panels should be prepared by testing laboratory. Surface preparation for a system shall be done in accordance with this specification. For individual products testing, minimum shall be Sa 2.5. Colour photographs of test panels should be taken before and after the test and should be enclosed along with test report. Sample batch no. and manufacturer's test certificate should be enclosed along with the report. Test report must contain details of observation and rusting if any, as per the testing code.

14.3 Manufacturers should intimate EIL, details of sample submitted for testing, name of testing agency, date, and contact personnel of the testing agency.

15.0 RCC PAINTING

RCC structures shall be coated with protective coatings as per the requirements laid out in respective drawings/relevant documents.

15.1 Concrete surface preparation and coating application

a. The proper surface preparation of concrete surface is critical for ensuring strong adhesion of coatings, sealants, overlays, and repair materials. The surface preparation removes contaminants, weak layers (like laitance), and provides a rough texture for mechanical bonding.

b. The prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

c. The surface preparation shall remove protrusions such as from sharp edges, fins, and concrete spatter, voids and other defects that are at or near the surface. Concrete damaged by exposure to chemicals shall be removed so that only sound concrete remains. All contamination, form-release agents, efflorescence, laitance and curing compounds shall be removed.

d. Detergent water cleaning as described in ASTM D4258 shall be used to remove oils and grease from concrete.

e. The minimum surface preparation shall be as per SSPC-SP-13, Clauses 4.3.1, 4.3.2 & 4.4. The surface preparation method, or combination of methods, should be chosen based on the condition of the concrete and the requirements of the coating system to be applied by the CONTRACTOR. Inspection testing and acceptance criteria as applicable shall be as described in sections 5 & 6 of SSPC-SP-13.

f. The DFT of the applied coating shall be checked by using ultrasonic DFT gauge in accordance with SSPC-PA-9

g. All concrete surfaces to be prepared and coated shall be visually inspected for signs of concrete defects, physical damage, chemical damage, contamination, and excess moisture.

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h. All concrete should be cured using the procedures described in ACI 308. Curing requires maintaining of sufficient moisture and temperatures for a minimum time period. The surface preparation performed on insufficiently cured or low-strength concrete may result in excessively coarse surface profile or excess removal of concrete.

i. Concrete that has been damaged because of physical forces such as impact, abrasion, or corrosion of reinforcement shall be repaired before surface preparation if the damage would affect coating performance. Repairs should be made in accordance with ACI 301, ACI 562, ACI 546.

15.2 RCC coating system

Table 21- Coating system on concrete surface

S. No	Description	Coating system	Remarks
1	RCC super structure surfaces	1 Priming coat of water based 100% Acrylic exterior emulsion anti-carbonation primer with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50µ per coat + 3 coats of finish coat with water based 100% acrylic exterior emulsion anti-carbonation paint with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50 µ per coat = 3×50 = 150 µ	Note 1
2	All external Cooling tower RCC surfaces and structures, which are prone to carbonization as well as algae & fungus attack due to continuous exposure of water & sea water etc.	1 Priming coat of water based 100% Acrylic exterior emulsion anti-carbonation primer with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50µ per coat + 3 coats of finish coat with water based 100% acrylic exterior emulsion anti-carbonation paint with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50 µ per coat = 3×50 = 150 µ	Note 1
3	Cooling tower internal surfaces including all the inner surfaces but not limited to walls, columns, beams, basins, sumps, channels, all RCC above fills and below fills etc.	3 coats of F-7 @ 125 µ per coat. Total DFT=375 µ	-

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Notes for Table 21:

1. Contractor shall propose suitable coating product and submit their necessary datasheet, test certificates and Past Track record for EIL review and approval.
2. No painting shall be done in rainy season.
3. Painting shall be done in given pattern in desired colors preferably bright in shades. Colour Shall be Azure Blue for RCC foundations of pumps & Equipment and Ivory for Piperack. and track. For any other RCC structures, contractors shall propose suitable color code for EIL review and approval.

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ANNEXURE-I

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SPECIFICATION FOR THERMALLY SPRAYED ALUMINIUM (TSA) COATING

1.0 SCOPE

The following sections outlines the requirement of supply, application and testing of thermally sprayed aluminum coatings (TSAC) for corrosion protection of insulated critical carbon steel, LTCS, LAS equipment like vessels, reactors, columns & equipment within the design temperature range of 200-540°C. Contractor shall establish the criticality in consultation with BPCL/EIL, and finalize the type of under insulation coating required.

2.0 ITEMS TO BE THERMALLY SPRAYED

Vessels, reactors, columns & equipment to be protected by TSAC shall be as per Table 11.0 of this specification. Components thermally sprayed shall not have any uncoated area or shall not be in mechanically connected by flanges etc. to any uncoated bare steel work. Such adjacent areas to TSA coated areas, if not coated by TSA shall have suitable paint coating system as per the standard specification.

3.0 TSAC REQUIREMENTS

3.1 Surface Preparation

All the parts to be sprayed shall be degreased according to SSPC-SP 1. The absence of oil and grease after degreasing shall be tested by method given elsewhere in the specification (Refer Sec. 6.7 of this annexure). Thereafter the surface to be abrasive blasted to white metal finish as per NACE 1/SSPC-SP 5 for marine and immersion service. Using SSPC VIS 1, it is to be visually assessed that the blast cleaned surface meets requirement of SSPC-SP 5. Thereafter clear cellophane tape test as per ISO 8502-3 shall be used to confirm absence of dust on the blasted surface. Finally blasted surface shall be tested for presence of soluble salts as per method ISO 8502-9. Maximum allowable salt content shall be considered 20mg/m^2 (2 micrograms/cm^2). In case salt content exceeds specified limit. The contaminated surface shall be cleaned by method as per Annex C of IS 12944-4 (Water Cleaning). After cleaning the surface shall be retested for salt content after drying. Testing shall be carried out at least on each component, once per 200 m^2 and a min of 3 times per shift during progress of work.

The blasting media shall be either chilled iron or angular steel grit as per SSPC-AB-3 of mesh size G-16 to G-40. Copper, Nickel slag, Garnet or Aluminum Oxide as abrasives will also be suitable having mesh size in the range of G16 to G24 (10-30 mesh), conforming to SSPC-AB-1. Mesh size shall be required as appropriate to the anchor tooth depth profile requirement and blasting equipment used. The blasted surface should be having angular profile depth not less than 65 microns with sharp angular shape but shall not exceed 85 microns. The profile depth shall be measured according to NACE standard RP 0287 (Replica Tape) or ASTM D 4417 method B (Profile depth gauge).

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For manual blasting one profile depth measurement shall be taken every 10-20 m^2 of blasted surface.

Surface preparation shall be completed in one abrasive blast cleaning operation wherever possible.

If rust bloom (visual appearance of rust) appears on the blast cleaned surface before thermal spraying, the affected area shall be reblasted to achieve specified degree of cleanliness after which only thermal spraying shall commence.

Air blasting pressure at nozzle shall be normally maintained at 100 psi. Air pressure and media size should be reduced and adjusted to preclude damage/distortion to thin gauge materials. Blasting time on work piece should be adjusted to only clean the surface and cut required anchor tooth with minimum loss of metal. Blast angle should be as close to perpendicular as possible but in no case greater than $\pm$ 30 ^{0} from perpendicular to work surface. Blasting media must be free of debris, excessive fines, and contaminants such as NaCl and sulfur salts (Ref. Sec. 6.0 of this annexure). Blast cleaning shall not be performed when the surfaces to be blasted are wet or less than 3°C above dew point temperature or when the relative humidity in the vicinity of the work is greater than 85%.

3.1.1 Blasting Equipment

The TSAC applicator shall use mechanical (centrifugal wheel) or pressure pot blast cleaning equipment and procedures. Suction blasting equipment shall not be used. Sec 6.6.2 of this annexure shall be used to validate clean and dry air.

3.1.2 Feed Stock

The feed stock shall be in the form of wire. The feed stock shall be 99.5% aluminum of commercial purity grade, its composition shall be in accordance with requirement of BS 1475 or ISO 209-1 type A1 (wrought aluminum and aluminum alloys, wire). Wire shall be supplied in protective wrapping indicating batch number and other details.

3.1.3 Thickness Requirement

The nominal thickness of finished TSAC shall be 250 microns having minimum value of 225 microns at low thickness areas (valleys) and not more than 275 microns at peak areas.

The finished thickness shall be measured using SSPC-PA 2 type 1 fixed probe gauge (Magnetic Gauge).

3.1.4 Coating Bond Strength Requirement

The TSAC coating shall have a minimum individual tensile-bond strength value of 1000 psi for flame sprayed and 1500 psi for arc sprayed coating with an average of 2000 psi for arc

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sprayed coatings. Minimum tensile bond strength should be achieved by proper anchor tooth profile of blasted surface, laying down the TSA thickness in multiple passes and carrying out TSA application under controlled environment

3.1.5 Porosity

All thermally sprayed metallic coatings will have porosity. For thermally sprayed aluminum coatings porosity shall not exceed 15% of total surface area for flame sprayed coating and 8% for arc spray coating.

4.0 Thermal Spray Application Procedure

Items in the atmospheric zone to be coated by TSA shall be applied by either Flame spray or Arc spray method only. For coating under insulation, application shall be by arc wire method.

4.1 Equipment Set Up

4.1.1 Thermal spray equipment shall be set up calibrated, operated (1) according to manufacturer instructions/technical manuals and also TSAC applicators refinement thereto and (2) as validated by Procedure Qualification (Sec 7.0 of this annexure).

4.1.2 Spray Parameters

Spray parameters (see 4.1.3 below) and thickness of each crossing pass shall be set and shall be validated with bend test (See 6.5 of this annexure).

4.1.3 Spray Parameters

Spray Parameters	Method of Application	
Arc voltage	Arc wire Spray	Flame Wire Spray
	27 V	-
Air pressure	80 psi	80 psi
Steel surface cleanliness	NACE-1 white metal	NACE-1 white metal / or near white metal
Steel surface profile	60-75 microns	60-75 microns
Arc current	250-280A	-
Coating thickness	225 microns (nominal)	225 microns(Nominal)
Coating adhesion	> 1500 psi (Total coating), see 3.1.4	>1000 psi
Coating porosity	Less than 8%	Less than 15%.
Spray distance (spray Gun work piece)	6-8”	5-7”
Spray Pass width	40mm	20 mm

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The above parameters to be validated with a bend test by the contractor before start of work (for details of bend test see Sec 6.5 of this annexure).

4.2 Post Blasting Substrate Condition and Thermal Spraying Period.

4.2.1 The steel surface temperature shall be at least 3^0C above dew point of ambient air temperature.

Steel substrate surface temperature shall be recorded by with a contact pyrometer.
Thermal spraying should commence within 15 minutes from the time of completion of blasting

4.2.2 Holding Period

Time between the completion of final anchor tooth blasting and completion of thermal spraying of blasted surface should be no more than four hours. If within this period rust bloom appears Sec 4.4.1 of this annexure will apply.

4.3 Pre-Heating

For flame spraying, the initial starting area of 1-2 square feet to be preheated to approx.120 °C to prevent condensation of moisture in the flame on the substrate. For arc spraying the preheating is not required.

4.4 Thermal Spraying

Spraying should commence only after validation of equipment set up by procedure qualification test and spray parameter validation tests described in Sec 7.0 and 6.5 respectively. Thermal spraying must commence within 15 minutes from the time of completion of blast cleaning

The specified coating thickness shall be applied in several crossing passes. The coating bond strength is greater when the spray passes are kept thin. Laying down an excessively thick spray pass increases the internal stresses in TSAC and decreases the bond strength of total TSAC. The suitable thickness for crossing passes shall be determined by procedure qualification test described in Sec 7.0 of this annexure.

For manual spraying, spraying to be done in perpendicular crossing passes to minimize thin spots in coating. Approx. 75-100 microns of TSAC shall be laid down in each pass.

The surface geometry of the item or area to be sprayed should be inspected before application. The spraying pass and sequence shall be planned according to following.

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- Maintain Gun as close to perpendicular as possible and within $\pm 30^0$ from perpendicular to the substrate.

- Maintain nominal standoff distance and spray pass width as given below:

Spray method	Standoff (Inches)	Spray pass width (Inches)
Arc Wire	6-8	1 ½ (40mm)
Flame wire	5-7	¾ (20mm)

4.4.1 Rust Bloom (Visual appearance of rust or Discoloration)

If rust bloom appears on the blasted surface before thermal spraying, the affected area shall be re-blasted to achieve the specified level of cleanliness.
If Rust bloom in form of discoloration, or any blistering or a degraded coating appears at any time during application of TSAC, then spraying shall be stopped and acceptable sprayed area shall be marked off. The unsatisfactory areas shall be repaired to the required degree of surface cleanliness and profile.
Blast the edges of the TSAC to provide for 2-3" feathered area overlaps of the new work into existing TSAC.
Then apply TSAC to the newly prepared surfaces and overlap the existing TSAC to the extent of feathered edge so that overlap is a consistent thickness.

4.4.2 Masking

Masking all those parts and surfaces which are not required to be thermally sprayed as instructed by purchaser should be inspected by applicator to ensure that they are properly marked and covered by purchaser.

Complex geometries (flanges, valve manifolds, intersections) shall be masked by applicator to minimize overspray i.e. TSAC applied outside spray parameters (primarily gun to substrate distance and spray angle).

4.4.3 TSAC Finish

The deposited TSAC shall be uniform without blisters, cracks, loose particles, or exposed steel as examined with 10 X magnification.

5.0 SEALER

Sealant shall be applied after satisfactory application of TSAC and completion of all testing and measurements of the finished TSAC as per Sec 6.0 of this annexure. For shop work, sealer shall be applied immediately after thermal spraying and for field work sealer

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shall be applied within 8 hours. The sealcoat shall be thin enough to penetrate into the body of TSAC.

The sealant shall be silicone alkyd aluminium paint having DFT not more than 35-40 micron. Typically seal coat shall be applied at a spreading rate resulting in theoretical 38 microns DFT. The seal coat shall be applied in accordance with SSPC-PA 1 and the paint manufacturer instruction for sealing.

6.0 TESTING AND MEASUREMENT SCHEDULE

6.1 Surface Finish

That the blasted cleaned surface meets the required criteria (NACE 1/SSPC-SP 5) shall be visually inspected using SSPC-VIS 1. The clear cellophane-tape test as per ISO 8502-3 shall be used to confirm absence of dust or foreign debris on the cleaned surface. Checks shall be done on each component at least once per 200 m^2 of blasted surface and minimum of 3 checks per shift.

6.2 Blast Profile Measurement: (In-Process testing during actual production before application of TSA coating)

The angular profile depth measurement shall be done by profile tape as per method NACE Standard RP 0287 or ASTM D 4417 method B (Profile depth gauge micrometer). Spot measurement shall be carried out every 15m^2 of blasted surface. At each spot three measurements shall be taken over an area of 10 cm^2 and average of measurements to be recorded and reported.
If profile is <65 microns blasting shall continue till greater than 65 microns depth profile is achieved.

6.3 TSAC Thickness (In-Process Testing For finished coating during regular production)

6.3.1 TSAC finished thickness shall be measured using SSPC-PA 2 type 1 fixed probe gauge.

6.3.2 For flat surfaces, measurements shall be taken along a straight measurement line, one measurement line for every 15 m^2 of applied TSAC shall be selected along which 5 measurements to be taken at 25 mm internal and average to be reported.

6.3.3 For curved surface or complex geometry, 5 measurements shall be taken at a spot measuring 10 cm^2 in area. One spot to be taken for every 15 m^2 of applied TSAC area.

6.3.4 The TSAC thickness in surface changes or contour changes, welds and attachments shall be also measured and reported.

6.3.5 If TSAC is less than specified minimum thickness, apply additional TSAC until specified thickness range is achieved.

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6.3.6 All locations and values of TSAC thickness measurements shall be recorded in Job Record (JR).

6.4 Tensile Bond Testing (In-Process testing for finished coating during regular production)

- Tensile Bond strength of the TSAC finish coat shall be determined according to ASTM D 4541 using a self-aligning adhesion tester.

- One measurement shall be made every 50 m^2. If tensile bond at any individual spot is less than 1000 psi for flame sprayed coating and 1500 psi for arc sprayed coating the degraded TSAC shall completely remove and reapplied.

- The tensile bond portable test instrument to be calibrated according to ASTM C 633

6.5 Bend Tests

Bend test shall be carried out at beginning of each work shift. Bend tests shall also be conducted on sample coupons before start of thermal spraying work to qualify the following as mentioned earlier in this specification.

- To qualify spray parameters and thickness of each crossing pass.

6.5.1 Test Procedure

a) Five corrosion control steel coupons each of dimension 50 mm x 150 mm x 1.3 mm thk. to be prepared.

b) Surface shall be prepared by dry abrasive blast cleaning as per this specification.

c) TSAC shall be applied as per specified thickness range. TSAC should be sprayed in crossing passes laying down approx. 75-100 microns in each pass.

d) TSAC applied coupons shall be bent 180^0 around a 13 mm diameter mandrel.

e) Bend test shall be considered passed if on bend radius there is

- No cracking or spalling or lifting by a knife blade from the substrate

- Only minor cracking that cannot be lifted from substrate with a knife blade.

f) Bend test fails if coating cracks with lifting from substrate.

6.6 Tests for blasting media, blasting air

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6.6.1 Blasting Media (For every fresh batch of media and one random test during blasting)

Blasting Media shall be visually inspected for absence of contamination and debris using 10 X magnification.

a) Inspection for the absence of oil contamination shall be conducted using following procedure:

- Fill a small clean 200 ml bottle half full of abrasive.
- Fill the bottle with potable water, cap and shake the bottle.
- Inspect water for oil film/slick. If present, the blasting media is not to be used.

b) Soluble salt contamination if suspected shall be verified by method ASTM D 4940. If present, media to be replaced.

c) Clean blasting equipment, especially pot and hoses, and then replace blasting media and retest.

6.6.2 Test for Blasting Air (Once Daily before start of blasting and once at random during blasting)

The air for blasting shall be free from moisture and oil. The compressor air shall be checked for oil and water contamination per ASTM D 4285.

6.7 Test for presence of oil/grease and contamination

The steel substrate after degreasing as per SSPC-SP 1 shall be tested as per following procedure to validate absence of oil and grease contamination.

a) Visual inspection - Continue degreasing until all visible signs of contamination are removed.
b) Conduct a solvent evaporation test by applying several drops or a small splash of residue-free trichloromethane on the suspect area especially pitting, crevice corrosion areas or depressed areas. An evaporation ring formation is indicative of oil and grease contamination.
Continue degreasing and inspection till test is passed.

7.0 TSAC APPLICATOR QUALIFICATION

Following tests to be carried out as part of procedure qualification test for the applicator.

- Thickness measurement
- Coating bond strength
- Porosity test
- Bend strength

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TSAC applicator's surface finishing and application process and equipment set up, calibration and operation shall be qualified by application of TSA on a reference sample which shall be used as a comparator to evaluate the suitability of application process. Only that applicator will be permitted to carry out the work when test specimens coated by the applicator meets the desired requirements as cited below.

The sample shall be made of a steel plate measuring approx. 18"x 18" x ¼" thick. If the actual work is less than ¼" thick then the sample to be made from material of representative thickness.

The surface preparation, TSAC application shall be made with actual field equipment and process/spray parameters and procedures as per the specification. The depth profile of blasted surface, TSAC coating thickness for each cross pass and total thickness range shall be as per specification.

The surface preparation and thermal spraying shall be carried out in representative environmental conditions spraying with makeshift enclosure.

7.1 After application of coating, thickness and tensile bond measurements shall be made in following manner.

- Divide the sample piece into four quadrants.
- Measure thickness along the diagonal line of each quadrant.
- Four each quadrant five in-line thickness measurements at 1" interval shall be done using SSPC-PA 2 type 2 fixed probe gauge. Thus, a total of four "five in line" thickness measurements to be done for the whole sample.
- One tensile bond measurement using ASTM D 4541 type III or IV portable self-aligning test instrument to be done at center of each quadrant. Total of 4 measurements for the sample.
- One porosity evaluation test by Metallographic examination shall be conducted to demonstrate the achievement of porosity within the limits specified. Sample shall be prepared for Metallographic examination as per ASTM E-3.
- The procedure shall be considered qualified if thickness and tensile-bond strength and porosity values meet the specification requirement.

7.2 Bend test: Bend test shall be carried out as detailed at sec. 6.5 of this annexure.

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Applicators thermal spray equipment set-up, operation and procedure of application including in-process QC checkpoints adopted during procedure qualification as described above should be always subsequently followed during entire duration of work.

8.0 DOCUMENTATION

The following information shall be provided by TSAC applicator before award of work.

- TSAC application process consisting of equipment capabilities and their technical parameters, feed stock material and source of procurement.

- Detailed application procedure and in-process quality control check points for (a) surface preparation (b) thermal spraying (c) seal coats.

- Type and specification of instruments to be deployed for measurement of blast profile depth, TSAC thickness and tensile bond.

- Paint manufacturer data sheet for the selected sealing coat to be applied.

- Applicator shall submit repair procedure and all relevant documents for restoring the existing TSAC which will be removed for routine maintenance/NDT testing.

9.0 RECORDS

- The TSAC applicator shall maintain job record to record production and QC information. All the results of the tests and quality control checks shall be entered in the record for each component/part thermally sprayed. All the result of tests (thickness, tensile bond, bend tests) and other validation tests (e.g. procedure qualification test, test for surface cleanliness after abrasive blasting, test for cleanliness of abrasives and air) shall also be recorded and duly signed by owner.

- All the information mentioned in Sec 8.0 above should also form part of the Job record.

- Any modification affected after procedure qualification in the procedure, QC, spray parameter, equipment spec to the original information (submitted before award of the work) must also form part of Job record.

10.0 WARRANTY

The TSAC applicator shall warrant the quality of material used by providing the purchaser with a certificate of materials used to include

- Spray feed stock: Alloy type/designation, Lot Number, wire diameter, chemical analysis, name of supplier, manufacturer.

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- Sealant: Name of manufacturer, application data sheet.

11.0 SAFETY

The TSAC applicator shall follow all safety procedures required by the purchaser/owner. Owner shall also give compliance requirement to be followed by applicator. The applicator shall follow all appropriate regulatory requirements.

12.0 CODES AND STANDARDS

This specification shall apply in case of conflict between specification and following applicable standards:

AWS C. 2.17	Recommended Practice for Electric arc Spray.
ASTM C 633	Test Method for Adhesive/Cohesive Strength of Flame Sprayed Coatings.
ASTM D 4285	Method for indicating Oil or Water in Compressed Air.
ASTM D 4417	Test Method for Field Measurement of Surface Profile of Blasted Steel.
BS 2569	Specification for Sprayed Metal Coating.
NACE Standard RP 0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape.
ASTM D 4541	Test method for Pull-Off Strength of Coating Using Portable Adhesion Testers.
ANSI/AWS C2.18	Guide for the Protection of Steel with Thermal Spray Coatings of Aluminum, Zinc and Their Alloys and Composites.
NACE No. 12/AWS C2.23M/SSPC-CS 23.00	Specification for the application of thermal spray coatings (Metallizing) of aluminum, zinc, and their alloys and composites for the corrosion protection of steel.
SSPC Publication	The inspection of coatings and linings: A Handbook of Basic practice for Inspectors, Owners, and Specifiers.
SSPC-AB 1	Mineral and Slag Abrasives.
SSPC-AB 3	Ferrous Metallic Abrasives.
SSPC-PA 1	Shop, Field, and Maintenance Painting of Steel.
SSPC-PA 2	Measurement of Dry Coating Thickness with Magnetic Gages.
NACE No. 1/SSPC-SP 5	White Metal Blast Cleaning.
NACE No. 2/SSPC-SP 10	Near –White Metal Blast Cleaning.
SSPC-VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.

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Annexure-II

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25. CRUDE OIL TANKS PAINTINGS

25.1 Scope

This standard exclusively covers the painting of crude oil storage tanks in BORL Refinery including COT, Vadinar. This standard has been derived from existing SOP/09/11, Rev.-1 & AE-S-5430, Rev. 2 (BPCL, MR) and painting practices being followed at BPCL MR. Intent of this standard is to have better protection of Crude tanks against adverse environments.

25.2 Tank operating conditions

Operating temperature: Not above 65 degree Celsius.
Operating pressure: Ambient.

25.3 Surface preparation

The purpose of surface preparation is to create a continuous highly adherent, homogeneous and defect free paint film with an even thickness over the tank surfaces. For new painting, **all the internal & external surfaces shall be blasted to achieve the surface profile as given in Annexure – A.** Light shades and streaks are not allowed. When steel shot is used, it shall be used together with steel grit. The purpose of surface preparation is to create a continuous highly adherent, homogeneous and defect free paint film with an even thickness over the tank surface. Compressed air used shall be free of moisture and oil. Adequate separators and traps shall be provided, installed in the coolest part of the system. The presence of oil and water shall be determined at least two (2) times per eight hours and following every compressor start-up. The air discharge temperature shall not exceed 100 °C. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the materials for liners. Blasting nozzles shall be replaced when the specified minimum blast pressure, surface cleanliness and surface roughness can no longer be achieved. Blasting equipment and the equipment being blasted shall be properly earthed to prevent the occurrence of electrostatic discharges. If possible, vacuum collector shall be installed for collecting the abrasives for recycling. Recycled shot shall be used only after ensuring that it is clean enough to provide the minimum surface preparation mentioned above.

When working in confined spaces, adequate ventilation and intrinsically safe lighting shall be used. As a minimum, ventilation shall ensure sufficient air changes such that the threshold limit value (TLV) of the various coating materials in use shall not be exceeded. Access for coating work should be constructed so as to provide easy and sufficient access for surface preparation, painting and inspection of all surfaces

25.4 Recommended environment conditions for Paint Application

For all cases, paint manufacturer guidelines shall be followed. Following restrictions are given as

recommended practices:

25.4.1 Coating application shall not be permitted in the following conditions.

4.1.1 During fog, mist or rain.

4.1.2 When the relative humidity is 85 percent or above.

4.1.3 When the steel surface temperature and/or ambient temperature is below 10°C (50°F).

4.1.4 When the steel surface temperature and/or ambient temperature is above 50°C (120°F).

4.1.5 When the steel surface temperature is less than 3°C (5°F) above the dew point.

25.4.2 For all internal painting work, the dehumidification of the surrounding air dew point shall be maintained 5 degree Celsius below the prevailing surface temperature. The relative humidity shall be maintained not more than 45% from preparation to curing of coatings. It is strongly recommended to use Dehumidifiers to maintain the better conditions for painting and effective results.

25.4.3 The measurement of the following shall ensure prior to start of work and shall be done every three hours for the entire duration of the painting work and shall extend till the paint is dried and cured.

4.3.1 Relative Humidity (RH).

4.3.2 Ambient air temperature.

4.3.3 Surface temperature of the object being painted.

4.3.4 Air temperature at surrounding of the painting.

4.3.5 Air flow

25.4.4 There shall be no welding activity or radiography testing on the shell during and after installation of coating system.

25.4.5 Humidity and dew point readings shall be taken with a sling Psychometric meter and calculated using psychometric tables.

25.4.6 Coatings shall not be applied before the surface has been inspected and the preparatory work approved.

25.4.7 All edges shall be ground to a minimum radius of 3.2 mm. Flame cut areas and weld spatter shall have been ground flush. All rough welds shall be ground to remove sharp edges and other such irregularities. The amount of grinding performed shall be judicious and performed only to the extent necessary to prepare the weld surface and surrounding metal surfaces in accordance with the specification. Over grinding, which would result in

decreasing the wall thickness or the integrity of the weld beyond the limitations imposed by good welding practices, applicable welding codes, or tank or vessel ratings, shall be avoided. All weld spatter and arc strikes must be removed. (Refer NACE SP 0178).

25.4.8 Salt water spray areas shall require fresh water blasting or fresh water (Max. Chloride content 50 ppm) mopping to remove the salts deposited on metal surface before application of primer. Mopping can be repeated before application of other coats to remove salts deposited on previous coats, if such deposits are suspected.

25.4.9 Blast cleaned steel surfaces shall not be touched by bare hand.

25.4.10 If the surface being cleaned is adjacent to a coated surface, the blast cleaning shall cut in to the coated surface by at least 50 mm. The edges of the existing coating system shall be feathered. The remainder of the existing coated surface shall be properly protected with shields or screens to prevent any over blast damage.

25.4.11 To prevent dust and abrasive contamination, blast cleaning shall not be carried out adjacent to painting operations or wet (painted) surfaces.

25.5 Mixing and Painting

25.5.1 Mixing & Thinning

All paint spraying equipment, including mixers, shall be thoroughly cleaned before mixing of new materials. All coating materials shall be mixed and thoroughly stirred in accordance with the instructions of the paint Manufacturer. Sufficient agitation to maintain good mixing shall be applied until the product is used. If air is entrapped in the product during mixing/stirring, sufficient time should be allowed for the air bubbles to escape before application.

25.5.2 Application of paint/primer:

5.2.1 Blast cleaned surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hrs. the same day or as per the time frame stipulated in the technical data sheet of the paint, whichever is earlier.

5.2.2 To the maximum extent practicable, each coat of material shall be applied as a continuous film uniform thickness free of porous. Any spots or areas missed in application shall be recoated and permitted to dry before the next coat is applied. Applied paint should have the desired wet film thickness.

5.2.3 No coat shall be applied until the preceding coat has dried and cured as

recommended by Paint Manufacturer. Next coat shall be applied within the time stipulated by the paint manufacturer. Before over coating, over-runs, drips and smears shall be removed and any coating damage or imperfection shall be repaired. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of undercoats. Drying time of the applied coat should not exceed maximum specified for it as a first coat; if it exceeds the paint material has possibly deteriorated or mixing is faulty.

5.2.4 No paint shall be force dried under conditions, which will cause cracking, wrinkling, blistering formation of pores, or detrimentally affect the conditions of the paint. No drier shall be added to paint on the job unless specifically called for in the manufacturer's specification for the paint. Paint shall be protected from rain, condensation and contamination until dry.

5.2.5 All paints and painting materials shall be stored only in rooms to be arranged by contractor and approved by Engineer-in-charge for the purpose. All necessary precautions shall be taken to prevent fire.

5.2.6 Surface preparation and paint application shall be done in presence of Manufacturer’s representative. Manufacturer’s representative shall have necessary certification from agency like NACE to supervise and ensure the quality of paint applied.

5.2.7 All personnel shall be provided with personnel protection, e.g. protective clothing, safety glasses, safety shoes, hard hats, goggles, respirators, earplugs, fresh air-fed hood and any other necessary safety equipment. All safety equipment shall be maintained in a good working condition. Warning signs shall be prominently displayed at all access points to areas where abrasive blasting and painting is in progress.

5.2.8 The Contractor shall protect all equipment, structures and any other areas from mechanical damage, environmental damage, blockage or obstruction and damage caused by over blasting, dripping paint, paint splashes and overspray.

5.2.9 To minimize the risk of damage, no lifting, transportation, erection or fabrication operations shall be done before the paint has been fully dried and/or cured.

5.2.10 Abrasive blast cleaning and coating operations should be carried out during daylight hours. However, grit blasting and coating may be carried out at night providing the lighting and environmental conditions are acceptable. Minimum lighting requirements for abrasive blasting, painting and inspection are 500 lux.

5.2.11 For internal tank coatings and the external coatings of buried or immersed equipment and structures, pinhole testing for electrically non-conductive coatings shall be carried out in accordance with NACE SP0188. The high voltage technique shall be used; nominally set at 5 V/µbased on DFT, or as agreed with the paint Manufacturer but not exceeding 25 kV in total. For coating thickness < 500 µ DFT, the low voltage wet sponge technique shall be used.

25.5.3 Spray application

Spraying is the required method of application. The painting Contractor shall supply the required range of spray tips, sizes and fan angles for the work being undertaken. The spray pressure shall be uniform and the spray pattern smooth.

25.5.4 Brush application

Brush application may be done for Maintenance operations, in those cases where spray application may affect other plant, equipment, property or personnel in or near the work site. Where the coating product is specified as only being suitable for brush application. Manufacturer shall confirm in writing that paint is suitable for brush application and will able to meet the guarantee period. Brush application shall be done only with concurrence of Engineer in charge. Coatings applied by brush shall be smooth and even

25.5.5 Roller application

Roller application shall only be allowed for steel floors and for panels and equipment inside climate-controlled areas. Rollers shall be of good quality to ensure uniformity of the applied coating.

25.5.6 Stripe coat

Before spray application of each coat, irregular surfaces such as sharp edges, welds, small brackets, interstices etc. shall be stripe-coated, usually by brush, to ensure the specified film thickness is provided. Stripe coat shall be applicable in all the painting systems.

25.5.7 Repair of coating defects

Damaged areas, defects in the coating system such as over-runs, drips and smears that have to be removed or areas with inadequate dry film coating thickness shall be re-cleaned. The re-cleaning shall carry over on to the sound coating for not less than 50 mm all round, the edges of which shall be feathered.

After the surface cleaning, the specified coating system shall be re-applied. Any additional coats shall blend in with the final coating at adjoining areas. Paint Manufacturers shall be consulted if the existing coating requires abrading before over-coating to obtain good bonding.

25.5.8 Only thinners specified by the paint Manufacturer shall be used

25.6 Paint Procurement

Painting Contractor shall procure paint material from BORL approved manufacturers only.

25.7 Inspection and testing

25.7.1 Refer **section 18** or point no. **25.12** for testing of paint material

25.7.2 Minimum suggested stages of inspection shall be:

a. Surface Preparation
b. Primer application
c. Each coat of paint

25.7.3 All defects noticed during stages of inspection, shall be rectified free of cost by the contractor. All records shall be kept by the contractor.

25.7.4 Wet film thickness measurements shall be made throughout the course of painting in order to ascertain the adequacy and uniformity of thickness. The readings shall be taken at least one every ten (10) square meters.

25.7.5 Dry film thickness shall be taken on each coat after drying and curing of the coat. Dry film thickness (DFT) readings shall be taken using a non-destructive dry film thickness instrument capable of storing the readings. Sufficient readings shall be taken covering each coat prior to application of the following coat to ensure the correct required DFT.

25.7.6 The DFT indicated against each system shall be obtained by applying one or more coat of the paint based on paint properties. The Contractor is responsible to obtain the indicated DFT as per painting system specification.

25.7.7 DFT meter used shall be calibrated before each inspection and shall be witnessed by the Inspector. It is the duty of the Inspector to satisfy him/herself with the performance of the DFT meter.

25.7.8 Criteria for acceptance of painting work shall be in accordance with table – 2.

TABLE - 2

Test	Standard	Frequency	Acceptance criteria
Surface cleanliness	ISO 8501-1	One per ten (10) square meters	Sa 2 ½
Surface Profile	ISO 8503-2	One per ten (10) square meters	As per coating procedure / data sheet
Total Soluble salt contamination [1]	ISO 8502-9	One per twenty (20) square meters or minimum 5 tests whichever is more.	<5 g/cm^2
Dust	ISO 8502-3	One per ten (10) square meters	Rating 2 or better
Adhesion	ISO 4624	One pretest panel, per shift	5 MPa
Holiday Detection	NACE SP0188	100% of surface	Zero defects
Dry Film Thickness [1]	SSPC PA-2	As per Annexure - F	Shall not be less than 80 % and more than 120 % of the Specified dry film thickness. (DFT).
Wet Film Thickness	ISO 2802	One per ten (10) square meters	Consistent with providing required DFT

25.8 Painting Contractor's Responsibility

25.8.1 Contractor shall mobilize the adequate capacity dehumidification unit at site for all internal painting work, if required. The surrounding air dew point shall be maintained 5 degree Celsius below the prevailing surface temperature. The relative humidity shall be maintained not more than 45% from preparation to curing of coatings.

25.8.2 The contractor shall ensure proper functioning of the dehumidification unit, measuring RH and temperature, measuring air flows and maintained 24 hours till coating work is completed in the tank.

25.8.3 All paints and consumables for a particular tank painting work shall be sourced from one manufacturer only to have desired paint performance, guarantee and single point responsibility.

25.8.4 Painting contractor shall deploy adequate number of NACE CIP Level 2 qualified

coating Inspectors to supervise, monitor, inspect & control entire painting process right from the surface preparation, storage, handling, mixing and application on substrate of the painting/coating and to ensure the compliance of this specification. These qualified painting inspectors will report to and shall get guided by BORL Inspection Dept.

25.8.5 Each contractor shall possess relevant standards and deploy all inspection tool/instrument to carry out the all above inspection and testing as per relevant standard.

25.8.6 Organizing of testing all the painting parameters, supply of all the testing instruments, consumables for testing each parameter as defined in clause 7.10 above, including getting accepted by BORL, shall be the responsibility of painting contractor.

25.8.7 The Inspection test plan which will be mandatory part of the contract shall be prepared by the above qualified coating inspector and get it approved by BORL inspection department. The Contractor's qualified coating inspector and BORL shall sign an inspection report as per approved inspection test plan.

25.8.8 The report shall consist, as a minimum, of the following in addition to the inspection parameters and acceptable criteria:

8.8.1 Names of the applicator and the responsible personnel.
8.8.2 Dates when work was carried out.
8.8.3 Paint testing parameters tested
8.8.4 Equipment and techniques used.
8.8.5 Type and calibration of instruments used.
8.8.6 Weather and ambient conditions.

25.9 Frequency and Guarantee of painting

25.9.1 Frequency of Crude oil tanks Painting system for both internal and external painting shall be once in 10 years.

25.9.2 Painting Contractor shall furnish Guarantee for minimum 10 years for both internal and external painting with shot blasting as per Annexure – B, C, D & E.

25.9.3 BORL reserves the right to invoke the guarantees in case contractor (paint applicator) or contractor fail to repair the paint failed area within reasonable time.

25.10 Painting system

25.10.1 The painting system shall be as mentioned in Annexure – A.

25.10.2 No painting is considered for roof legs for new tanks. Roof legs to be hot dip galvanized. Schedule 80 pipes to be used for both roof legs and sleeves. The sufficient clearance shall be ensured between sleeves and roof legs. However, painting shall be as per directions & recommendations of inspection in case of Old roof legs with CS pipes or as applicable.

25.11 SIGN WRITING

All painting work information shall be mentioned (sign writing) with date of completion on Tank shell as per Engineer-in-charge instructions.

25.12 INSPECTION AND TESTING OF PAINTING MATERIAL

25.12.1 All the procured paint material along with batch/test certificates shall be offered for BORL inspection for approval. Remaining Shelf life shall be at least 90% of the total duration at the inspection above.

25.12.2 All paint materials shall be accompanied by Manufacturer Test Certificate. Inspection Engineer at his discretion may test paint formulations, if required.

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ANNEXURE – A

THIS PAINTING SYSTEM SHALL BE APPLICABLE FOR CRUDE TANKS AT COT VADINAR FOR ALL EXTERNAL PAINTINGS EXPOSED TO ENVIRONMENT AND FOR CRUDE TANKS AT BINA REFINERY FOR TOP SHELL COURSE PAINTING (FREE BOARD) & EXPOSED PORTION OF FLOATING ROOF
(APPLICATION - AIRLESS SPRAY)

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTAL DFT, MICRONS
1	Bottom plate under side (soil side)	Blast cleaning with grit and shot to Sa 2.5	Profile of 40-70 microns	1 Coat of F-15@ 100 DFT/Coat	2 Coats of F-15@ 100 DFT/Coat 2x100 = 200	300
2	Top shell internal 100 mm above top of shunt of secondary seal marked at safe filling height during hydro test. (Free Board area)	Blast cleaning with grit and shot to Sa 2.5	40 microns	1 coat of F9 (VS 65%; 85% zinc on dry film minimum) – 1X 70 Microns DFT + 1 coat of P-6 @ 40µ DFT/ coat (Two component polyamide cured epoxy resin medium, pigmented with zinc phosphate)	1) Low VOC (Volatile Organic Compounds) two component internally flexibilised high build surface tolerant epoxy pigmented with Aluminum & Lamellar Micaceous Iron oxide coating – 2 X 125 µ - Note 1 2) F2- One (1) coats of aliphatic acrylic polyurethane with minimum 55% vol solids - 2 x 40 microns DFT.(in approved colour only)	400

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTALDFT, MICRONS
3	a) Shell external surface. b) Vertical Gauging band.	Blast cleaning with grit and shot to Sa 2.5	40 microns	1 coat of F9 (VS 65%; 85% zinc on dry film minimum) – 1X 70 Microns DFT + 1 coat of P-6 @ 40µ DFT/ coat (Two component polyamide cured epoxy resin medium, pigmented with zinc phosphate)	1) Low VOC (Volatile Organic Compounds) two component internally flexibilised high build surface tolerant epoxy pigmented with Aluminum & Lamellar Micaceous Iron oxide coating – 2 X 125 µ- Note 1 2) F2- Two (2) coats of aliphatic acrylic polyurethane with minimum 55% vol solids - 2 x 40 microns DFT.(in approved colour only)	440

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTALDFT, MICRONS
4	Roof deck plates top surface (Floating roof top surface)	Blast cleaning with grit and shot to Sa 2.5	40 microns		1) Two component Amine / Amine adduct cured high solid glass flake epoxy coating (in conformance to ISO 20340) – 2 X 300 micron DFT – Note- 1 2) F2- Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat) – 2 X 40 micron DFT	680
5	Pontoon inside surface	SSPC-SP10 / SA 2 ½ **OR** SSPC – SP2/ST2	Not applicable	1 coat of F9 (VS 65%; 85% zinc on dry film minimum) – 1X 70 Microns DFT **OR** 1 Coat of F-8 @ 100µ DFT/Coat	1) Low VOC (Volatile Organic Compounds) two component internally flexibilised high build surface tolerant epoxy pigmented with Aluminum & Lamellar Micaceous Iron oxide coating – 2 X 125 µ- Note -1	320 **OR** 350

SYSTEM FOR EXTERNAL PAINTING OF CRUDE TANKS AT BORL, BINA REFINERY (EXCEPT FREE BOARD INTERNAL AND FLOATING ROOF TOP SURFACE WHICH SHALL BE AS PER ABOVE TABLE)

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTALDFT, MICRONS, MIN
1	External surfaces of bottom plate (soil side) for Crude tanks.	Blast cleaning with grit and shot to SA 2.5	Profile of 40-70 microns	1 Coat of F-15@ 100 DFT/Coat	2 Coats of F-15@ 100 DFT/Coat 2x100 = 200	300
2	External shell, wind girders, rolling and stationary ladders, spiral stairways, hand rails for all environments for crude oil	Blast cleaning with grit and shot to SA 2.5	Profile of 40 microns	1 coat of F-9 @ 65-75µ + 1coat of P6 @ 40 µ DFT / coat	2 coats of F-6A @ 100µ DFT /coat + 1 coat of F-2 @ 40µ DFT/ coat	345

SYSTEM FOR INTERNAL PAINTING OF CRUDE TANKS AT BPCL, BINA REFINERY (EXCEPT FREE BOARD) & AT COT, VADINAR (FOR INTERNAL FREE BOARD SECTION OF CRUDE TANK AT BORL, BINA, REFER ABOVE TABLES)

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTALDFT, MICRONS, MIN
1	Underside of floating roof, oil side surface of pontoons, support structures and ladders and other CS internals etc, inside of bottom plate, internal surface of bare shell for 1.5 mtr from bottom , for storing **Crude Oil and Crude +**	Blast cleaning with grit and shot to SA 2.5	Profile of 40 microns	1 coat of Primer* @ 75 µ DFT/ coat (Primer shall be compatible with F-6C & F-6C should be suitable for immersion service of products given)	2 Coats of F-6C @ 300µ DFT/ Coat 2X300=600	675

	Water Tank (52-TT-CR-15).					

SR. NO.	SURFACES	SURFACE PREPARATION	SURFACE PROFILE	PRIMER	FINISH COAT	TOTALDFT, MICRONS, MIN
2	Internal surfaces of bare shell above 1.5 mtrs from bottom including underside of cone roof and supporting structures for Crude + Water Tank (52-TT-CR-15).	Blast cleaning with grit and shot to SA 2.5	Profile of 40 microns	1 Coat of F-15 @ 100 µ DFT/Coat	2 Coats of F-15 @ 100µ DFT/ Coat 2X100=200	300
3	Inside surface of pontoon of all floating roofs.	Blast cleaning with grit and shot to SA 2.5		1 Coat of F-8 @ 100µ DFT/Coat	1 Coat of F- 8 @ 100µ DFT/Coat	200

Notes

1) Contractor shall submit suitable product datasheet, PTR and test certificate, for EIL review and approval.
2) Stripe coat is must for weld area, edges and corners.
3) Over zinc silicate, intermediate coat to be applied in mist coat and full coat technique.
4) In PU paint of silver shade, total thickness to be built in two coats.
5) For PU paint QUVA 340 requirement of 80 % gloss retention after 3000 hrs.
6) All sharp edges to be grinded well before painting.
7) Pitted area having width greater than 2mm or depth greater than 5 mm to be filled with solvent less polyamine adduct cured epoxy.
8) Camouflaging not to be done

Annexure-III

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Paint Inspection
Daily Coating Inspection Report

Project/Client:	Date: / / Su M Tu W Th F Sa	Pg ____ of ____
Location:	Project #:	Copy to: ☐ QC Super ☐ Owner ☐ Contr ☐ ____
Description:	Inspector:	Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ ____
Requirements:		
Contractor:	Spec #:	Revision #:

Description of Areas and Work Performed

Hold Point Inspections Performed

- ☐ 1. Pre Surface Preparation/Condition and Cleanliness
- ☐ 2. Surface Preparation Monitoring
- ☐ 3. Post Surface Preparation/Cleanliness and Profile
- ☐ 4. Pre Application Prep/Surface Cleanliness
- ☐ 5. Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6. Post Application/Application Defects
- ☐ 7. Post Cure/Dry Film Thickness (DFT)
- ☐ 8. Nonconformance/Corrective Actions Follow-Up
- ☐ 9. Final Inspection

Approved by:

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure ____
☐ Steel ☐ Galvanize ☐ Concrete ☐ Other ____
☐ Hazard ____ ☐ Sample Report # ____
☐ Degree of contamination: ____
Test: ☐ Cl ____ µg/cm² (µs/cm) ☐ Fe ____ ppm ☐ pH ____
☐ Degree of Corrosion: ____
☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges
☐ Weld ____ ☐ Moisture ☐ Oils ☐ Other ____
☐ Painted Surface Condition: ____
Dry to: ☐ Touch ☐ Handle ☐ Recoat
☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays
☐ Abrasion ☐ Fall Out ☐ Other ____

Ambient Conditions

Time (Indiciate AM or PM)	:	:	:	:
Dry Bulb Temp° (C/F)	°	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	%	%	%	%
Surface Temp° (C/F) Min/Max	/ °	/ °	/ °	/ °
Dew Point Temp° (C/F)	°	°	°	°
Wind Direction/Speed				
Weather Conditions				

Surface Preparation

Start Time: Finish Time: Est Sq Ft:
☐ Solvent Clean ☐ Hand Tool ☐ Power Tool
☐ HP Wash PSI ____ ☐ Other ____
☐ Abrasive Blast ☐ Abrasive Type ____ ☐ Sample
☐ Blast Hose Size ____ ☐ Nozzle Size/PSI ____
☐ Air Supply CFM ____ ☐ Air Supply Cleanliness
☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness and Profile Measurement

☐ Job Specification ☐ SSPC/NACE SP ____
☐ SSPC/NACE Spec/Visual Stds ☐ ____
☐ Profile Check ____ ☐ Disc ☐ Tape ☐ Gage
☐ Specified ____ mils avg/Achieved ____ mils
☐ Surface Effect on DFT Gage/BMR ____ mils

Application

Start Time: Finish Time: Est Sq Ft:
☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-Up

Generic Type:	Qty Mixed:
Mfr:	Mix Ratio:
Prod Name:	Mix Method:
Prod #:	Strain/Screen:
Color:	Material Temp: °F
Kit Sz/Cond:	Sweat-In Time: Min/Hrs
Shelf Life:	Pot Life: Min/Hrs
Batch #s	Reducer #:
(A)	Qty Added: Pt/Qt/Gal
(B)	% by Vol: %
(C)	Specified WFT Avg: Mils
Reducer:	Achieved WFT Avg: Mils

☐ Airless/Conv Spray ☐ Brush ☐ Roller ☐ Other ____

Pump Pot:	Hose Diameter:	Air Check:
Ratio/Size:	Hose Length:	SEP/Trap:
GPM/CFM:	Spray Gun:	Filter:
PSI:	Tip Size:	Agitator:

Inspector Signature: Date:

Dry Film Thickness (DFT) Gage Calibration Record

Gage Type/ Model	Gage Serial #	Plate/Shim Mils/µm	Gage Adj +/–	Spec Avg DFT	DFT Last Coat	DFT This Coat

WELDING SPECIFICATION FOR FABRICATION OF PIPING

(SMMS DIVISION)

PROJECT : **EPCC TENDER FOR POLYPROPYLENE & BUTENE-1 UNIT OF BINA PETCHEM & REFINERY EXPANTION PROJECT (BPREP)**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED**

PMC : **ENGINEERS INDIA LIMITED**

JOB NO. : **B957**

1	07-01-2026	REISSUED FOR TENDER	Ritik	Uttam	Prabhakar
0	24-12-2024	ISSUED FOR TENDER	Uttam	Prabhakar	R Chitara
Rev. No	**Date**	**Purpose**	**Prepared by**	**Checked by**	**Approved by**

AMENDMENTS/ADDITIONAL REQUIREMENTS

Specification No.: 6-77-0001 Rev.5

Title: Welding specification for fabrication of piping

Following amendments/additional requirements shall be applicable:

1. Addition in Clause 5.0:

   5.9: The ferrite number of the austenitic welds shall be in the range of 3FN to 8FN unless otherwise specified in the welding specification chart for piping. The ferrite number shall be measured during welding procedure qualification.

2. Modification of Clause 14.2 (e) as : New PQR shall be established for this job.

3. Addition in Clause 14.6 (a):

   Wherever MPI is required for inspection of alloy steel welds, use WFMPI instead of MPI.

4.

5. Addition in Clause 14.8:

   Hardness checking of alloy steel welds (P No. 4, 5A, 5B, 15E) shall be verified using the standard blocks having same P No.

6. Exhibit- M (Automatic Welding Procedure Guideline) added:

EXHIBIT M: AUTOMATIC WELDING PROCEDURE GUIDELINE

1.0 INTRODUCTION

All welding procedures can be classified as manual, semi-automatic, mechanized, automatic and robotic system. Automatic welding is a generic term for welding processes using equipment that perform welding of two components without the continuous involvement of an operator. It increases the productivity, improve weld quality, reliability and safety.

2.0 SCOPE

This document provides the guidelines for use of various arc welding processes as automatic/robotic/mechanized system in the field. Autogenous welding process is not permitted. The use of this procedure is mainly aimed at piping and structural weld joints.

3.0 DEFINITIONS

Automatic welding is defined as "Welding with equipment which performs the welding operation without adjustment of the controls by a welding operator. Manual adjustments may be made between welding operations but not during welding. The equipment may or may not perform the loading and unloading of work."

Mechanised welding is defined as "Welding in which the welding parameters are controlled mechanically or electronically and may be manually varied during welding to maintain the required welding position."

Robotic welding is defined as "Automatic welding using a robot that can be pre-programmed to different welding paths and fabrication geometries."

Welding operator is defined as "one who operates machine or automatic welding equipment." **Semiautomatic arc welding** is defined as "arc welding with equipment which controls only the filler metal feed. The advance of the welding is manually controlled."

4.0 REFERENCE STANDARDS

a) IS-7310-1,Approval tests for welders working to approved welding procedure, Part I: Fusion welding of steel.

b) AWS D1.1, Structural welding code—Steel.

c) ASME BPV SECTION IX, Welding, Brazing and Fusing qualifications.

d) ISO 14732, Welding personnel—Qualification testing of welding operators and weld setters for

e) mechanized and automatic welding of metallic materials.

f) API RP 582, Welding in the oil and gas industries.

5.0 BASE MATERIALS APPLICABLE

CS, LTCS, Alloy steels, Stainless steels, Ti alloys, Ni alloys

6.0 WELDING PROCESS

The limitations stated in API RP582 (latest edition) for various welding process shall be applicable in addition to the following.

a) Orbital Tungsten Inert Gas (TIG) welding

b) Gas Metal Arc Welding (GMAW)

- GMAW equipment manufacturer shall specify the range of current for various filler wire diameters for classification as short-circuit, spray, globular and pulsed metal transfer mode.
- GMAW-S (short-circuit) shall be used in the root pass when the backside of the weld is accessible and the root pass is completely removed from the backside.

c) Flux Cored Arc Welding (FCAW)

- Only Gas shielded FCAW process shall be employed for pressure retaining weld joints.
- During butt welding, FCAW process shall be employed for other than root passes.

d) SAW

- For field application, the welding machine set-up shall be approved by the site-in-charge.
- Alloy fluxes shall not be used as defined in ASME Section II Part C SFA 5.17 and SFA 5.23.
- The maximum bead width shall be 7X the electrode diameter.
- The maximum individual layer thickness for submerged arc welds shall not exceed 9.5mm or 3 times electrode diameter.
- Fluxes recommended for single pass by manufacturer shall not be used for multiple pass welds.
- Welding procedure shall be requalified whenever welding flux or wire is changed from one manufacturer to another, or from one grade to another of the same manufacturer.
- SAW shall not be used for pipes of NPS 8 inch and below.

7.0 WELDING PROCEDURE QUALIFICATION

a) Welding procedure qualification shall be carried out using same make and model of welding equipment, program, controller parameter settings.

b) The position limitations listed in ASME Section IX, QW-461.9 shall be considered an essential variable for procedure qualifications.

c) Bevel preparation and tolerances for the test piece and production joints shall be similar.

Repair welding procedure shall also be qualified. Manual welding process may be used for repair procedures.

8.0 WELDING OPERATOR QUALIFICATIONS

a) Operators handling robotic welding system and automatic welding machines shall have completed specialized training and safety courses and submit valid certificate issued by their company.

b) Each welding operator shall be qualified as per ASME Section IX or any other standard specified in the design code for all welding.

c) The test records of all welding operators shall be available at all times at the job location.

9.0 PRODUCTION WELDING

a) Joint bevel preparation and fit-up shall be similar to that carried out during welding procedure qualification.

b) Only qualified operators shall be performing the Welding.

c) Any unplanned interruptions during welding shall be reported to the site-in-charge. Welding shall be resume after assessing the impact of interruption on weld quality.

d) Inspection of finished welds shall be carried out as per the ITP.

e) Repair rate of each welding operator shall be recorded.

JOB SPECIFICATION FOR EXTERNAL COATING OF BURIED PIPING, VALVES, FLANGES AND FITTINGS

PROJECT: MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED

MPMC : ENGINEERS INDIA LIMITED

JOB NO : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	04-02-2025	ISSUED FOR JOB SPECIFICATION	JATIN	SAHIL	SRIDHAR

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7.0 MARKING

ABBREVIATIONS:

API: American Petroleum Institute
DIN: Deutsches Institut für Normung
3LPE: 3 Layer Polyethylene
FJC: Field Joint Coating
HSS: Heat Shrinkable Sleeves

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1.0 SCOPE

This specification specifies the minimum technical requirements for pipes externally coated with extruded / sintered 3-layer polyethylene (3LPE) in shop or field and the fittings / flanges / valves / strainer body externally coated with liquid epoxy in the shop or field. These externally coated pipes and fittings are intended for the usage in the buried conditions. The list of items to be coated given in this specification is not exhaustive. This specification is applicable for all items which are in buried condition.

This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this specification to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2.0 REFERENCES

BS EN ISO 21809-1: External coatings for buried or submerged pipelines –Polyolefin coatings
DIN 30670: Polyethylene coatings on steel pipes and fittings – Requirements and testing
DIN EN 10289: Steel tubes and fittings for onshore and offshore pipelines
BS EN ISO 21809-3: External coatings for buried or submerged pipelines -Field joint coatings

3.0 MATERIALS

3.1 Coating materials shall be suitable for the service conditions and the pipe sizes involved in the project. The 3LPE coating system for pipes shall comprise of a powder epoxy primer, polymeric adhesive and a medium or high-density polyethylene top coat. The coating materials i.e. epoxy powder; adhesive and polyethylene compound shall have proven compatibility. The compatibility of all the three components shall be ensured by manufacturer / applicator.

3.2 Fittings shall be coated with liquid applied epoxy coating material

3.3 Buried field joints of 3LPE pipe shall be coated with heat shrinkable sleeves / Cold applied tapes defined as per clause 4.3 of this specification.

4.0 FUNCTIONAL REQUIREMENTS AND PROPERTIES OF COATING

4.1 3LPE coated pipes

4.1.1 General requirements

The 3LPE coating shall preferably be applied by side extrusion method as per BS EN ISO 21809-1 for piping which are having a design temperature up to 80°C. However, for design temperature up to 70°C, 3LPE coating by sintering method is also acceptable and shall conform to DIN 30670 (Type S) and table-1 of this specification. Total thickness of the coating shall conform to thickness class ‘n’ as per table-3 of DIN 30670.

Cut back provision for pipes and fittings shall be as follows:

For pipes smaller than DN 600 the length of the cutback shall be no greater than 150 mm, for larger pipes the cutback shall be (150 ± 20) mm. For three-layer coatings, the epoxy resin and adhesive layers at the pipe ends shall be removed to at least 80 mm

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from the welding bevel. A not less than 20 mm strip of epoxy resin or epoxy resin and adhesive should extend from the cutback of the polyethylene coating. For coating thicknesses up to 2.2 mm the bevel angle shall be no greater than 45°, for greater coating thicknesses the bevel angle shall be no greater than 30°.

Table-1: Properties of 3 LPE Coatings

PROPERTY	REQUIREMENT	TESTING AS PER DIN 30670	NOTES
Cathodic disbondment (CD test)	23 °C/28 d or 60 °C/2 d max. 7 mm	Annex C	-
Peel strength	70 N/cm (23 °C) 30 N/cm (70 °C)	Annex D	For system testing single values shall beno more than 25 % lower than the required average value.
Continuity (holiday detection)	No discharges	Annex E	25 kV test
Elongation at break(23 °C ± 2 °C)	min. 300 %	Annex F	-
Impact resistance(23 °C ± 2 °C)	≥ 7 J/mm	Annex H	25 kV test No discharges
Low temperature impact resistance	≥ 7 J/mm (−40 °C ± 2 °C)	Annex H	25 kV test No discharges
Indentation resistance	max. 0,2 mm (23 °C) max. 0,4 mm (70 °C)	Annex I	-
Specific electrical coating resistance (23 °C ± 2 °C)	≥ 10^8 Ωm²	Annex J	-
UV resistance	⊿MFR ± 35 %	Annex K	-
Thermal ageing resistance	⊿MFR ± 35 %	Annex L	-

4.2 Epoxy coated fittings, flanges and valves

Fittings shall be coated with liquid epoxy conforming to DIN EN 10289 (Class C and type 3) and table-2 of this specification. Thickness of the coating shall be minimum 1500 microns. Wherever epoxy coated fittings are to be welded with 3LPE coated pipes or fittings, it is the responsibility of the supplier/coating applicator to ensure a proper cut

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back in such a way that the coating is not damaged during welding. Specific written approval of EIL to be obtained in case there is difficulty in complying with this requirement, supplier to submit justification for the same. The joints between two epoxy coated fittings shall be coated with liquid epoxy as per DIN EN 10289, Class C and type 3.

Table-2: Properties of Liquid Epoxy Coatings

PROPERTIES	REQUIREMENTS		TESTING AS PER DIN EN 10289
Hardness Shore "D"	Specified by the manufacturer		Clause 7.3
Appearance and continuity	Uniform colour, smooth appearance and free from defects		Clause 7.4
Cut back	(150 ± 20) mm		Clause 7.5
Holiday detection	Free from holiday		Clause 7.6
Impact resistance	(23 ± 2) °C	(- 5 ± 3) °C	Clause 7.7
	5 J X k X mm (mm of coating thickness)	3 J X k X mm (mm of coating thickness)	
Adhesion test Resistance to removal	(23 ± 2) °C	maximum service temperature ± 2 °C	Clause 7.8
	min. rating 2	Results for information	
Cathodic disbondment	Average	Maximum	Clause 7.10
	<=6 mm	<= 8 mm	
Specific electrical insulation resistance	Minimum Rs after set number of days at constant temperature		Clause 7.11
Indentation resistance	(23 ± 2) °C	maximum service temperature ± 2 °C	Clause 7.13
	max 0.2 mm	<=30 % of initial measured thickness	

4.3 Field joint coating

The joint between 3LPE coated pipe and epoxy coated fitting shall be protected by heat shrinkable sleeves / cold applied tapes conforming to codes 14-B / 19-E respectively as per BS EN ISO 21809-3.The FJC shall meet the requirements as mentioned in table-3 & 4 of this specification.

Note: Liquid epoxy coating conforming to DIN EN 10289, Class C and type 3 can also be applied as field joint coating where there is practical difficulty in applying HSS / Cold applied tapes subject to approval by the OWNER / PMC. A certificate for compatibility of liquid epoxy with 3LPE coated pipes shall be obtained from liquid epoxy coating manufacturer and submitted to OWNER / PMC for approval. Epoxy coating shall comply to the Table-2 of this specification.

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Table-3: Properties of Heat Shrinkable sleeves

PROPERTY	TEST TEMP.	UNIT	REQUIREMENTS	TEST METHOD AS PER BS EN ISO 21809-3
Thickness – Sleeve Layers	-	-	>= specified min. value	Annex B
Holiday detection at 5 kV/ mm + 5 kV	-	-	No holiday	Annex C
Impact resistance (holiday detection at 5 kV/mm + 5 kV)	23 °C	J/mm	≥7	Annex D
Indentation resistance: Pressure	T_{max}	N/mm2	10,0	Annex E
Residual thickness		mm	≥0,6	
Amount of penetration		mm	—	
Cathodic disbondment at 28 days	23 °C	mm	≤5,0	Annex G
	T_{max} limited to 95 °C	mm	≤10	
Peel strength at 10 mm/min to pipe surface and to poly- olefin plant coating	23 °C	N/mm	≥5,0	H.1
	T_{max}	N/mm	≥0,30	
Peel strength at 10 mm/min to pipe surface and to poly- olefin plant coating after 100- day hot-water immersion test at T max limited as per Annex I	23 °C	P100/P0	≥0,75	Annex I and Annex H
Lap shear strength at 10 mm/ min	23 °C	N/mm2	≥3,0	Annex J
	T_{max}	N/mm2	≥0,20	
Elongation at break E100/ E70)	23 °C	—	≥0,75	Annex M
Peel strength to pipe surface (P100/P70)		—	≥0,75	

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Table-4: Properties of Cold applied tapes

PROPERTY	TEST TEMPERATURE	UNIT	VALUE	TEST METHOD AS PER BS EN ISO 21809-3
Holiday detection at 10 kV/mm, max. 25 kV	—	—	No holiday	Annex C
Peel strength	23 °C	N/mm	>15	Annex H
	T_{max}	N/mm	>4,0	Annex H
Adhesion to pipe surface and plant coating after 28-day hot-water immersion test at T_{max} limited as per Annex I	23 °C	—	>10 N/mm	Annex I plus Annex H
Cathodic disbondment at 28 days	23 °C	mm	≤7	Annex G
	T_{max}	mm	≤10	Annex G
Impact resistance	23 °C	J/mm	5 × α × β	Annex D
Indentation resistance at a pressure of 10 N/mm2	T_{max}	mm	≤1,0	Annex E

5.0 INSPECTION AND TESTING

The contractor shall establish and maintain a proven quality assurance system to ensure that supplied pipes & fittings comply in all respects with the requirements of this specification. The minimum inspection and testing to be performed shall be as per relevant clauses of DIN 30670, BS EN ISO 21809-1 & 3 and DIN EN 10289. Prior to starting the coating job, the contractor /supplier/coating applicator shall prepare coating application procedure and ITP based on the above mentioned standards in consultation with OWNER/PMC and submit for their approval. Coating Job shall start only after approval of the same.

6.0 HANDLING, TRANSPORTATION AND STORAGE

6.1 The vendor shall load, unload, transport and stockpile the coated pipes, flanges, valves and fittings within the coating plant using approved suitable means and in a manner to avoid damage to the coating.

6.2 Coated pipes, flanges, valves and fittings may be handled by means of slings and belts of proper width (minimum 60 mm) made of non- abrasive/non-metallic materials. In this case, pipes, flanges, valves and fittings to be stacked shall be separated row by row to avoid damages by rubbing the coated surface in the process of taking off the slings. Use of round sectional slings is prohibited. Forklifts may be used provided that the arms of the forklift are covered with suitable pads, preferably rubber/PVC/Teflon.

6.3 Coated pipes, flanges, valves and fittings at all times shall be stacked completely clear from the ground, at least 300 mm, so that the bottom row of pipes remains free from any stagnant surface water. The pipes and fittings shall be stacked at a slope so that driving rain does not collect inside the pipe. Coated pipes and fittings may be stacked by placing them on ridges of sand free from stones and covered with a plastic film or on wooden supports provided with suitable cover. Flanges and valves shall be provided with covers/wrapping to ensure that there is no water stagnation/accumulation to protect the coating. This cover can be of dry, germ free straw covered with plastic film, otherwise

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foam rubber may be used. The supports shall be spaced in such a manner as to avoid permanent bending of the pipes. Stacks shall consist of limited number of layers such that the pressure exercised by the pipe's own weight does not cause damages to the coating. Each pipe section shall be separated by means of spacers suitably spaced for this purpose. Stacks shall be suitably secured against falling down and shall consist of pipe sections having the same diameter and wall thickness. The weld seam of pipes shall be positioned always in a manner so as not to touch the adjacent pipes. The ends of the pipes and fittings during handling and stacking shall always be protected with bevel protectors.

6.4 The trucks used for transportation shall be equipped with adequate pipe supports having as many round hollow beds as there are pipes to be placed on the bottom of the lorry bed. Total width of the supports shall be at least 5% of the pipe length and min. 2 no. support shall be provided. These supports shall be lined with a rubber protection and shall be spaced in a manner as to support equal load from the pipes. The rubber protection must be free from all nails and staples where pipes are in contact. The second layer and all following layers shall be separated from the other with adequate number of separating layers of protective material such as straw in plastic covers or mineral wool strips or equivalent, to avoid direct touch between the coated pipes.

All stanchions of Lorries used for transportation shall be covered by non-abrasive material like rubber belts or equivalent. Care shall be exercised to properly cover the top of the stanchions and other positions such as reinforcement of the truck body, rivets, etc. to prevent damage to the coated surface. Slings or non-metallic straps shall be used for securing loads during transportation. They shall be suitably padded at the contact points with the pipe.

6.5 In case of any marine transportation of coated pipes, flanges, valves and fittings involved, the same shall be carried out in compliance with API RP 5LW.

7.0 MARKING

Vendor shall place marking on the outside surface of the coating at one end of the coated pipe and marking shall be as per the requirements of DIN 30670, BS EN ISO 21809-1 & 3 and DIN EN 10289.

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JOB SPECIFICATION
FOR
CATHODIC PROTECTION SYSTEM

PROJECT	**:**	**MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)**
OWNER	**:**	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC	**:**	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	**:**	**B957**

Rev No.	Date	Purpose	Prep. By	Checked by	Approved by
0	11/03/2026	ISSUED FOR TENDER	AD	SD	RC

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Annexure-1

1) Standard Specification for Cathodic Protection System for Underground Vessels, 6-45-0032, Rev.1.
2) Specification for installation, pre-commissioning, testing and commissioning of cathodic protection system for vessels, 6-45-0060, Rev 0.

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1.0 SCOPE OF WORK

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1.1 SCOPE OF WORK FOR CATHODIC PROTECTION SYSTEM (CP SYSTEM)

The work to be performed by the EIL/ OWNER approved CP contractor shall comprise of design, detailed engineering, supply, installation, testing and commissioning of Impressed Current Cathodic Protection (CP) System for soil/ sand side corrosion prevention of Underground Vessels inside pit filled with sand/soil within the scope of this project.

This document is not intended to be all-inclusive and the use of the guidelines set forth here do not relieve the CONTRACTOR of his responsibility of providing adequate CP System, which shall be proved performing to the entire satisfaction of the OWNER/ EIL.

The successful EPC contractor shall furnish all necessary details with supporting documents of proposed CP contractor (List of orders executed with copies of work orders/ technical details of work executed, completion certificate of CP contractor during detail engineering stage.

The contractor needs to supply all materials, consumables in his scope of supply from EIL/ Owner approved vendor list. The items which are not listed, the same shall be considered based on proven track record (PTR) basis for application of minimum one year period and five years for critical items such as MMO wire anode (filled with factory coke breeze and connecting lead cable), Surge diverter, SSPC (solid state polarization cell) / DC Decoupler and Reference electrode with satisfactory performance record (Refer technical specification of items). The contractor shall provide all construction tools, tackles, equipment and personnel necessary for the work and prepare detailed engineering package including construction drawings before starting of the work. After commissioning of the system commissioning report along with as built drawings including soft copies in latest version of AutoCAD and operating manuals to be prepared.

The Contractor needs to keep vigilance and take all precautionary measures to prevent fire hazards during execution of job.

1.2 SCOPE OF WORK FOR CATHODIC PROTECTION SYSTEM INSTALLATION

1.2.1 Item wise works envisaged under this Contract will comprise of the following:

Preparation and submission of Detail Engineering package as per Design basis and job specifications enclosed in this document. The detail engineering package shall include, as a minimum, design calculations, Bill of quantities, layout drawings of all materials/ equipments of CP System, Connection schemes and wiring diagrams, Installation procedures, name of equipment suppliers, shop/ field testing & inspection plan for equipment, necessary technical information/ datasheets, fabrication/ construction drawings, testing and commissioning procedures and formats, Quality control/ Quality assurance documents etc. & obtain approval from OWNER/ EIL before execution of work. CONTRACTOR needs to obtain approval on all layout drawings of cathodic protection materials/ equipment at site from OWNER/ EIL before starting the installation work.

1.2.2 Carry out Soil Resistivity test, detailed engineering, Supply all materials, equipment and perform all erection and installation work as per approved detail-engineering package. Provision of all service connection to T/R units including power cable starting from power source to PDB and PDB to TRU shall be in CONTRACTOR's scope of work.

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1.2.3 Shop testing of all major contractor supplied CP equipment (T/R, Anode, Cables, Junction Boxes, and RTU etc.) and submission to EIL of Test results/ certificates for approval before delivery of equipment.

1.2.4 Field-testing of individual components of CP System as per approved detail engineering package. Final commissioning of installed system as per approved procedure and submission to EIL of results thereof.

1.2.5 Liaison with other agencies, seek and obtain all permission related and obligatory to his part of the work.

1.2.6 Preparation and submission of 1 set of soft copy and 6 sets of hard copies to client and one set each soft and hard copy to EIL for records for all as built CP System package comprising of operation and maintenance manual for equipment, as-built drawings, Material specifications and Pre-commissioning/ Commissioning results.

1.2.7 After Commissioning of the CP System, if it is found that structure to electrolyte potential achieved at some location is in the range which is below acceptable limit as per code, then a supplementary CP System need to be installed to bring the potential level at such locations within acceptable limit as mentioned vide section 2.0 for "Design Basis/ Philosophy for CP System".

1.2.8 CONTRACTOR shall give performance guarantee for CP System for applicable equipment as per design basis and job specifications and operation guarantee of the material and equipment supplied by him as well as guarantee against defective workmanship for installation work carried out by him.

1.3 INSTRUCTION TO BIDDERS

1.3.1 Site Particulars

It shall be the bidder's responsibility to have a thorough understanding of the reference documents, site conditions and specification included therein. The intending bidders shall be deemed to have visited the site and have studied the conditions before submitting the Bids. Non-familiarity with the site conditions will not be considered a reason either for extra claims or for not carrying out the work in strict conformity with the drawings and specifications.

1.3.2 Every item of work and supply by CONTRACTOR shall be subject to Engineer-In-Charge scrutiny, supervision and approval. Any work carried out or supplies affected without such approval shall stand automatically rejected and his claim for compensation for such unauthorized work shall be null and void.

1.4 SPECIFIC REQUIREMENTS FOR CP SYSTEM WORKS

1.4.1 General

Clauses given under specific requirements for CP System works shall be read in conjunction with

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General conditions of contract and in case of any conflict, the provisions of specific requirements for CP System works will override the provision of general conditions of contract.

1.4.2 EIL/ OWNER shall have the right to inspect the following:

- Workshop & production facilities available with CONTRACTOR or its tie up agency.
- Fabrication/ testing of material/ equipment to be supplied by CONTRACTOR or its tie up agency for CP system.

1.4.3 It shall be Bidder's responsibility to arrange access for EIL/ OWNER Personnel for such visits. All costs related with travel, boarding, lodging for EIL/ OWNER personnel for such visits (if any) shall be borne by EIL/ OWNER.

1.4.4 Materials

1.4.4.1 Material Supplied By Owner

No material for CP System shall be supplied by owner.

1.4.4.2 Material Supplied by Contractor

The Contractor shall procure, supply all materials, equipment and consumables required for the work in his scope. Technical specifications of major items are given in section 3.0 for "Job specification for CP System", of this document. Supply of all balance materials, consumables not covered in section 3.0 for "Job specification for CP System", but required for completion of work as per this specification shall be entirely Contractor's responsibility. The rates quoted for the execution of the Contract shall be inclusive of all Contractor supplied material and equipment.

1.4.5 Warranty

Contractor needs to provide design guarantee for the system as per codes and standards & the protection criteria mentioned in the section Design basis/ Philosophy of this document also shall replace/ repair or reinstall free of cost any material/ equipment supplied or installed by him in case it fails to operate due to defective material or workmanship as per requirements of this specification within 12 (Twelve) months from the date of issue of completion certificate and acceptance of the CP System by Owner. Contractor shall replace at his own cost if any item found defective or missed before handing over the system to owner.

Comprehensive Annual Maintenance (AMC) for CP System for 1 year is in CP Contractor’s scope after Guarantee/ Warrantee period is over.

1.4.6 Construction Aids, Equipment, Tools and Tackles

Contractor shall be solely responsible for making available for executing the work, all requisite construction equipment, special Aids, tools, tackles and testing equipment and appliances, all instruments including automatic Programmable current interrupters required for commissioning and

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interference testing of the system. Such construction equipment shall be in first class operating condition. Any discrepancies pointed out by Owner/ EIL shall be immediately got rectified, repaired or the equipment replaced all together by Contractor. Owner/ EIL shall not in any way be responsible for providing any such equipment, machinery tools and tackles etc. The Owner/ EIL reserves the right to re-arrange such deployment depending upon the progress and priority of work in various sections at no extra cost to Owner.

1.4.7 Transportation, Packing and Handling

Contractor shall be responsible for transportation of all equipment/ materials required for CP system work and unload the same at allotted area at site.

1.4.7.1 To protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage in open during monsoon including delays in transit. Bidder shall be responsible for any damage to equipment/ material due to above reasons.

1.4.7.2 Bidder to refer Section 2.0 for "Design Basis/ Philosophy for CP System", Section 3.0 for "Specification for CP System material & equipment", Section 4.0 for “Mandatory Spares for Cathodic Protection System”,

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2.0 DESIGN BASIS/ PHILOSOPHY FOR CP SYSTEM

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ABBREVIATION

AJB	:	Anode Junction Box
CP	:	Cathodic Protection
CPTR	:	Cathodic Protection Transformer Rectifier
CJB	:	Cathode Junction Box
MJB	:	Monitoring junction Box
MMO	:	Mixed Metallic Oxide
PCP	:	Permanent Cathodic Protection
CMS	:	Central monitoring system
RTU	:	Remote Terminal Unit
PLC	:	Programmable logic controller
DW	:	Deep well
GL	:	Ground Level

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1.0 Codes and Standards

The entire work shall be performed as per the following codes/ standards.

NACE	: SP-0169, SP-0285, SP-0177, SP-0286
OISD	: OISD 150
DIN EN 50162 VDE 015:	Protection against corrosion by stray current from direct current (DC) systems.
BS EN 12954	: Cathodic protection of buried or immersed metallic structures
IEC/ NEC/ IS	: Relevant codes
IS/ IEC: 60079	: Electrical Apparatus for Explosive Gas Atmosphere
IS/ IEC: 60529	: Classification of Degree of Protection Provided by Enclosures

Indian electricity act and rules framed there under.

Fire insurance regulations.
Regulations laid by Chief Electrical Inspector of State.
Regulations laid by Chief Inspector of Explosives.
Regulation laid by Factory Inspector of State.

Wherever the requirements in this specification are in conflict with any of the above standards, the requirements of this specification shall be binding.

2.0 Design basis:

Impressed Current Cathodic Protection (CP) System to be provided for Carbon Steel material for soil side corrosion prevention of underground vessels inside the pit and their connecting lines as applicable for the tender. Anodes to be considered for impressed current CP System shall be Mixed Metal Oxide (MMO) tubular and close distributed long line mixed metal oxide (MMO) wire anode piggyback connected with anode lead cable, factory pre-packed with coke breeze with factory connected tail cables as per structure design and site condition.

No Insulating joints shall be installed to isolate any incidental structures from CP System within the Battery limit. Hence the structures intended to be cathodically protected shall be in electrical continuity with many foreign structures within the plant complex such as RCC pavements, RCC foundations, earthing grids, other U/G structures, which are not intended to be protected. The CP current requirement therefore shall be governed by following factors:

- Surface area and coating quality of structures to be protected.
- Surface area and surface condition of nearby foreign structures including earth grid.
- Relative position of anode between foreign structure and structure intended to be protected.

To take care of such situation CP System shall be designed & installed in two stages by providing one preliminary design and another supplementary design for Impressed Current CP System as follows:

Preliminary design:

A preliminary design shall be made as per required scheme which shall be approved by Owner/ consultant. The quantities required for T/R units, Power Distribution Boards, anode beds of various configurations, Junction boxes (AJB, CJB, MJB, etc.), Cables of various sizes, Thermit weld connections,

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and any other materials as required shall be calculated by CP CONTRACTOR. The locations of T/R units, Distribution Boards, anode beds of various configurations, Junction boxes (AJB, CJB, MJB, etc.), Cables of various sizes, Thermit weld connections, shall be marked by CONTRACTOR in appropriate layout drawings and shall be submitted along with Detail engineering package to OWNER/ EIL for approval. The T/R Units, PDB, and MJB shall be installed at one location under a common sun/ rain shed in non-classified area near the equipment. Based on site condition, CP contractor shall decide location/distance of the CP equipment from the site plot plan/layout. Cathodic protection Transformer Rectifier unit (CPTR Unit) shall be oil cooled, outdoor type. The power supply for the T/R Unit/ PDB shall be drawn from the identified cubical of the electrical substation nearest to the equipment.

Supplementary design:

After energising CP System as per preliminary design, the unprotected/ under protected and over protected areas shall be identified and a supplementary design is to be made to bring all structures intended to be protected within acceptable potential limits.

The following criteria shall be followed to determine the protection levels:

- Maximum allowable equipment to soil potential with respect to Cu/ $CuSO_4$ ref. Cell: –1.10V (Instant OFF) for impressed current system.
- Minimum allowable equipment to soil potential with respect to Cu/ $CuSO_4$ ref. Cell: –0.850 V (Instant OFF) or –100mV polarization shift .
- Discretion to use any of the criteria shall solely rest with Owner/ Owner's Representative.
- Interference Criteria: +50mV positive shift.
- Design life of Anode = 25 years (minimum) for impressed current CP system.

a) While deciding number of modular type 75V/75A, 50V/50A, 25V/25A , 50V/75A, 50V/25A, 25A/12 V capacity T/R units, considerations must be given to see no T/R unit is loaded more than 75% of its rated output voltage & current capacity throughout design life while feeding load to a single or group of anode beds.

b) For continuous wire anode the anode current capacity shall be considered as 30mA/m for design purpose and tubular anode 6A rated current output to be considered.

c) Identification and mitigation of interference between structures to be protected as well as between the structures to be protected and foreign structures need to be carried out by the contractor as per the requirements of the codes mentioned in this document.

d) Earthing of all T/R Units, PDB and Junction Boxes need to be done by connecting the same with plant earthing grids, wherever plant earthing grids are not available nearby, a separate earth pit approved by OWNER/ EIL may be considered by contractor.

e) To avoid cable damage in the long run, all cables are to be laid at the cable trays wherever possible; underground cable laying through PVC/ HDPE conduit should be considered only when no cable trays are available nearby. All CP System cables need to be laid at power cable trays, all multi core- monitoring cables may be laid in either electrical or instrumentation cable trays whichever is available.

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f) The type of coating and operating temperature of each Equipment should be taken into consideration for all detail-engineering calculations.

g) If operating temperature of Equipment exceeds 25 deg C, protective current density shall be corrected @ 0.5mA/m2/deg. C up to 60 deg.C.

h) Connection of drainage cables and measurement cables to the structure shall be done by Thermit welding method.

i) Sand resistivity need to be considered for the structure CP System design as minimum 200 ohm- m or as measured at site whichever is higher.

j) The structure shall have suitable paint for the soil side corrosion protection

k) Reference cell shall be supplied along with required length of lead cable connected at manufacturer's factory as far as possible.

2.1 Design Scheme for Cathodic Protection (CP) System:

Free ends of each string anode shall be terminated to AJB through loop connection on sand cushions. Outdoor type, Transformer-Rectifier unit (T/R Unit) shall be installed to energise the anode strings through anode junction boxes (AJB). Rating of T/R unit shall be 75V/75A, 50V/50A, 25V/25A, 50V/75A, 50V/25A, 25A/12 V based on design calculations. T/R Unit shall have one or two outgoing positive header cables, which shall be terminated to post/ structure mounted AJB to be installed at suitable location near the structures. T/R Unit shall have one out going negative header cable, which shall be terminated, to a cathode junction box cum test station (CJB). CJB cum test station (CJB) shall be located at suitable location near the structures for the drainage connection and potential measurement. Two drainage cables and two measurement cables from each structure shall be terminated to its CJB. Power supply for the T/R Unit shall be drawn from the nearest S/S. OWNER shall provide one 63A/ 250A, 415V, TP circuit breaker/ Switch Fuse unit at the nearest S/S. CONTRACTOR need to lay one 3-phase, 4-wire (Required cable size) power supply cable from this circuit breaker/ Switch Fuse unit outlet to one outdoor type PDB near the T/R Unit location for distribution of power to the T/R Unit. The reference cell cables and the measurement cables from each structures shall be routed through the respective cathode junction box cum test station (CJB) to a single Monitoring Junction Box (MJB), which shall be located near the T/R Units and have the provision of measurement of structure to soil potential.

Also for monitoring of structure to soil potentials at the T/R unit, monitoring cables consisting of reference cell and measurement cables shall be laid between MJB and T/R unit for connection of at least three reference cells to T/R Unit panel. Rotary Selector shall be used at the TR Unit for measurement of potential for each reference cell. The T/R Units, PDB, MJB and RTU shall be installed at one location under a common sun/ rain shed in non-classified area near the Electrical S/S or near the process unit/ offsite area to be decided jointly at the detailed engineering stage by EIL / OWNER.

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Common Computerized central monitoring of all T/R units and the permanent reference cells of CP System shall be provided with the help of microprocessor based CP System remote terminal unit (RTU) for subject unit area. The central monitoring unit shall be located at Central Electrical substation.

2.1.1 U/G vessels:

RCC pit shall be provided for the U/G vessel, Anodes string employed for C.P. System of U/g vessels shall be located within the RCC pit. Specific installation requirements of String Anode shall be as follows:

- Anode strings shall be installed in the sand cushion surrounding the vessel at a distance of 500 mm from the vessel.
- Separation distance between consecutive String anode loop shall be uniform.
- Length of each longer side of the loop string anode shall be same as the length of the vessel + 0.6m.
- Minimum 4 No. of strings should be considered for each vessel.

Free ends of each anode string should be connected to AJB located at each end of the vessel. Thus 2 No. of anode lead cables from each anode string shall be terminated to AJB.

2.2 Detailed Engineering Works to be performed by Contractor for CP System:

Following detailed engineering works are to be performed by contractor based on scheme given vide item no. 2.1 and design basis given vide item no. 2.0 of this document for CP System:

- List of materials/ equipments to be procured from Indian market/ foreign market.
- Item wise list of vendors with their reference lists for supply of materials/ equipment.
- Calculation and Preparation of Bill of Quantities for all CP system materials and equipment required.

Bill of quantity along with detailed calculations and preparation of specifications, installation work procedures & fabrication/ construction drawings for following items:

- CP System power distribution board (PDB): Total quantity and connection scheme showing group of T/R units to be connected with each CP System PDB and connection details between owner's switch board and each CP System PDB.
- T/R unit: Total quantity, detailed circuit diagrams and their installation drawings.
- AJB/ CJB/ MJB: Total quantity and connection Scheme showing how group of anodes, anode beds and structure/ equipment are to be connected with each AJB/ CJB/ MJB. Also, fabrication drawing & schematic drawing for internal terminal arrangements and installation drawings for a typical AJB/ CJB/ MJB.
- Anodes: Total nos. of Anode strings and anode string to anode lead cable joint details for entire CP System and their layout arrangement drawings showing no. of anode strings in each. structure/ equipment. Construction drawings and work procedures for anode to cable jointing and also for installation of anode strings.

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Design calculations showing:

- Cables: Total quantity of cables and their layout drawing for each CP Station as well as for entire CP System for +ve header cables, -ve header cables, anode lead cables, earthing cables, drainage cables, power supply cables and multi-core monitoring cables.

- Cable to structure/ equipment joint: Total quantity of joints and details of a typical joint.

  T/R unit wise CP System layout drawing showing how each T/R unit is connected with group of anode strings for UG Vessel through AJB/ CJB/ MJB.

- Test points: All reference cells and anode strings should be marked in a single layout drawing.

- Overall CP System layout drawing including all test points, anodes, anode beds, AJB, CJB, MJB, cable routes on a plot plan. All CP System materials/ equipment shall be marked properly for easy identification on all appropriate drawings as well as on site.

- Preparation of testing & commissioning procedure for CP System.

- Preparation of construction drawings with soft copies before starting of installation/ procurement work, Preparation of Soft & hard copies of as built drawings after completion of CP System work, shall also be furnished.

- Quantified list of the major construction equipment, tools, tackles etc. including Diesel engine pump set for dewatering at cable/ pipe trench the BIDDER proposes to use for execution of the work.

- Details & list of vehicles proposed to be used by the CONTRACTOR during the entire construction & commissioning period for transportation of material, equipments, as well as movement of personnel within the plant area.

- Bar chart giving details how BIDDER plans to execute the work within the specified time schedule.

- Quality Assurance Plans/ Procedure

The CONTRACTOR shall establish document and maintain an effective Quality Assurance system as outlined in recognized codes etc. and Quality Assurance Plans included in Specifications etc. to ensure that the work is performed in a planned, systematic manner to the best quality standards and properly documented to provide confidence that materials supplied and/ or work executed and services performed by him conform to the applicable specifications and all the requirements of contract document and work executed by him shall perform satisfactorily over the entire period of its life.

The Quality Assurance Systems Plans/ Procedures of the CONTRACTOR shall generally cover the following aspects/ details, which shall be furnished by BIDDER along with, his detail- engineering package.

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i) A Quality Assurance Organogram with curriculum vitae of key personnel responsible for the Quality Assurance at site.

ii) Complete details pertaining to the responsibility authority and accountability of the Quality Assurance Organization of the CONTRACTOR at site.

iii) Equipments, material, Erection, Installation, Testing and commissioning control plans for quality testing/ inspection etc.

iv) Quality Control of processes such as Thermit welding, anode to cable jointing etc.

v) Control Procedures/ Plans for calibration and safe up-keep of instruments, gauges and similar testing equipments etc.

vi) Quality audit & Maintenance/ records/ procedures etc.

vii) Other relevant details.

Quality Assurance System Plans/ Procedures of the CONTRACTOR shall be furnished in the form of a QA manual. BIDDER shall be required to provide explanation pertaining to the details furnished by him in accordance with provisions contained in this clause and any further details, as sought for by OWNER/ EIL. In addition, all the Quality Assurance Programs/ Plans as per specifications enclosed with the Contract shall be fully complied with by the Contractor.

- Precautionary measures to be taken to prevent fire hazard during Thermit welding and Pin Brazing of structure/ equipment for the purpose of cable to structure/ equipment joint as well as during installation, operation & maintenance of CP System.

- All other information as required in individual job specifications shall be furnished by CONTRACTOR in his detail-engineering package.

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3.0 SPECIFICATION FOR CP SYSTEM EQUIPMENT AND MATERIALS

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3.1 SPECIFICATION
FOR OIL COOLED TRANSFORMER/ RECTIFIER UNIT

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SPECIFICATIONS AND TESTING OF OIL COOLED TRANSFORMER RECTIFIER UNITS

The specifications and testing procedure of transformer units are given as follows:

3.1 TRANSFORMER RECTIFIER UNITS (T/R UNITS)

The transformer rectifier units shall be a standard product of a manufacturer regularly engaged in production of cathodic protection power supplies. The units shall be supplied in accordance with the following specifications and data sheets.

3.1.1 CODES AND STANDARDS

In general the T/R Unit covered by this specification shall unless otherwise specified, be in line with the requirements of any of the latest applicable standard of:

a) Indian Standards Institution (ISI)

b) International Electrotechnical commission (IEC)

c) American Standards Institution (ANSI)

d) British Standards Institution (BS)

Wherever the requirements in this specification are in conflict with any of the above standards, the requirements under this specification shall be binding.

3.1.2 TRANSFORMER

The main transformer will be the isolation type having separate primary and secondary windings. An electrostatic shield, composed of heavy copper foil, shall be placed between the two windings and grounded to the rectifier cabinet, for this purpose a visible lead should be brought out from the copper foil which shall be connected to any of the mounting stud of the transformer core. Transformer winding wire insulation, winding interlayer insulation, core to winding insulation shall be class F type. The transformer core and winding will be dipped in thermosetting varnish and baked. Transformer varnish will meet the standards for 155 degree C operation. The transformer winding shall withstand 2,000 volt (RMS at 50 hertz) applied for one minute between the windings and between each winding and the transformer core. Maximum temperature of transformer oil will not exceed 85 Deg.C and air temperature inside the upper cabinet will not exceed 85 Deg.C at full load current at ambient temperature of up to 45 deg.C. Transformer full load efficiency will not be less than 95%.The auto transformer shall be similar to main transformer except it will have single winding and tapping for manual mode of control.

3.1.3 RECTIFYING ELEMENTS

The power rectification shall be done by Silicon diodes mounted on heat sinks of sufficient size to prevent the diode case temperature from exceeding 100^{o}C at ambient temperature as per data sheet. The peak inverse voltage rating and current ratings of the diodes shall be as per data sheet. The diodes shall be connected in Bridge circuitory for full wave rectification. Each diode in the bridge circuit shall be protected by a HRC fuse.

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3.1.4 A.C. INPUT

The transformer rectifier units shall be designed to operate on 240 volts (±10%) AC single phase, 50 Hz power supply. Inrush current limiting reactor of suitable rating to be provided at input line of the main transformer to avoid possibility of abnormal tripping of MCB while closing circuit using MCB.

3.1.5 D.C OUTPUT

The transformer rectifier shall be designed to operate continuously at 100% rated output current and 100% rated output voltage at input supply voltage 240v (±10%) without exceeding specified hot spot temperature limit and without damaging any components.

3.1.6 D.C OUTPUT ADJUSTMENTS

The DC output control shall be available in any of the following modes, with the help of a selector switch.

3.1.6.1 MANUAL MODE

Output voltage at 23 equal steps up to 100% rated voltage shall be available by means of coarse and fine tap changing switches for rated input supply voltage and 100% rated output current. Tapping for output voltage control shall be taken from a separate auto transformer. The controlled output voltage of the auto transformer shall be fed to main transformer input. The output of the main transformer shall be rectified for DC load supply.

3.1.6.2 AUTO MODE

Unit shall have CONSTANT OUTPUT CURRENT/ VOLTAGE CONTROL (AVCC MODE) in AUTO MODE as per Data Sheet.

CONSTANT CURRENT AND VOLTAGE CONTROL (AVCC MODE)

It will be possible to operate the T/R unit in either Constant Voltage Mode or Constant Current Mode.

Constant Voltage control feature shall be achieved by automatically adjusting T/R unit output voltage between 0 to 100% rated voltage through close loop control using T/R unit output voltage as feedback taken from the voltage divider inside the T/R unit so that T/R unit output voltage of any value between 0 to 100% rated voltage does not vary more than ±0.5V of set value when there is a change in input supply voltage of ±10% or change in load resistance over a specified range decided by the ratio of output voltage & current rating of the T/R Unit

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3.1.7 DC OUTPUT RIPPLE

The filter circuit shall be designed in such a manner that ripple factor does not exceed 5% RMS at rated load both in Auto and manual mode.

3.1.8 INPUT OVERLOAD PROTECTION

Protection from overloads on the input will be provided by Miniature circuit breakers of suitable rating on the input side. The trip point will be unaffected by ambient temperature. The trip handles of individual poles of circuit breaker will be mechanically linked so that all lines are opened when an overload occurs. In addition to above MCB, HRC fuse of suitable rating should be connected before MCB so that AC .input current is limited to max. 10% excess rated input current as per data sheet.

3.1.9 OUTPUT OVERLOAD PROTECTION

Protection from overload on the output in auto mode for T/R unit having either constant current control or constant pipe to soil potential control will be provided by another close loop SCR control circuitry giving automatic constant current control same as mentioned vide 3.1.6.2(i) except that it will act as back up control to main auto mode control. Separate PCB shall be used for main auto mode control and the backup control. The current limit for backup control is to be set by two limit switches marked "coarse" and "fine". The limits of the two switches shall be algebraically additive and shall give equal 30 steps up to 110% rated current. One scale calibrated in Ampere shall be provided with each limit switches so that current limit can be set by operator at any desired value in 30 equal steps. In any circumstances even in case of short circuit the T/R unit output current should not exceed the current limit set by the backup control.

In addition to above electronic current limiting feature HRC fuse of suitable ratings to be used at positive and negative terminals as well as one double pole MCB of suitable rating to be connected after HRC fuse at the output to disconnect T/R unit quickly in case of over loads in the output circuit or for ease of isolating T/R Unit from the circuit when it is desired to keep the T/R Unit in standby mode.

3.1.10 VOLTAGE SURGE PROTECTION

Each silicon controlled rectifier (SCR) and Diodes shall be protected from voltage surges by means of R-C/MOV circuitry. This R-C circuitry/MOV will be rated as recommended by the manufacturer of the SCR/

Diodes so that they will conduct heavily before the peak inverse voltage ratings of the SCR/ Diodes are reached. In addition, lighting arrestors and zener Barrier type or MOV type surge Diverters shall be provided in the AC input and DC output circuit of the Transformer rectifier as per data sheet.

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3.1.11 COOLING

The transformer/ rectifier will be Natural oil cooled (ONAN) completely enclosed IP55 construction. The temperature of the oil measured at the top layer shall not be more than 85 ^{O}C and maximum air temperature of the upper cabinet should not be more than 85^{O}C for ambient temperature of up to
45 ^{O}C.

3.1.12 INPUT AND OUTPUT TERMINALS

DC terminals made of tinned plated copper shall be located convenient to the cable entrance. The terminals shall be suitable for cable sizes as per data sheet. Three negative and three positive output terminals shall be provided.

AC terminals shall be insulated to withstand 2000 volts 50Hz to the enclosure, shall be shielded to prevent accidental contact and shall be sized to take cable sizes as per data sheet.

3.1.13 METERS

The transformer rectifier units shall be equipped with separate continuous reading voltmeter and ammeter for the DC output and the A.C. input voltage, current and Structure to electrolyte Potential measurement meter with selector switch for selection of different Structure to electrolyte Potential measurement meter. All meters shall be electronic digital type with LED display arrangement and should be able to indicate the current and voltage ranges as per data sheet up to a resolution of one decimal place for DC Ammeter & Voltmeter and 2decimal places for PSP meter. Digit size should be 12.5mm (minimum). All meters shall be rectangular in shape and accurate to within 2% at full load at ambient temp. as per data sheet. They shall be temperature compensated to vary no more than 1% per 10% temperature changes.

All AC&DC voltmeters shall be provided with separate fuse and toggle switch whereas all Ammeters shall be provided with only toggle switch.

3.1.14 ANNUNCIATION

Each transformer rectifier shall be supplied with a continuous signal light which will go out at loss of AC input. In addition to this each T/R unit should give annunciation for Auto and manual mode of operation by continuous signal light. T/R unit should also indicate the failure of each fuse in bridge rectifier and two DC output fuses by an independent LED for each.

3.1.15 ENCLOSURES

"The enclosure of T/R unit shall be plinth mounted type having two compartments. Lower compartment shall contain main transformer, Auto-transformer, DC choke and the compartment should be filled with Transformer oil to IEC 296. The upper compartment shall contain the SCRs, Diodes, indicating meters, Protective devices, Electronic control circuits/ control cords etc. and shall be provided with a plexi glass viewing window. Both the compartments shall be completely enclosed type having IP55 construction.

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The enclosure shall have a frame work made of minimum 50mmx 50mm x 3mm angle iron, the upper cabinet body shall be made of minimum 12SWG(2.5mm) W.T. sheet steel, lower cabinet shall be 10 SWG(3.0mm) W.T sheet steel. Size of enclosure shall be minimum 1500(H) x 700(W) x 550mm (D) or higher size than this. Necessary fins for the cooling purpose shall be provided at lower compartment. A detachable sun/ rain shade to be provided of suitable size.

The transformer rectifier shall be provided with the following accessories.

- Steel channel under the base for plinth mounting.
- Lifting lugs of size suitable for lifting complete transformer rectifier unit when full of oil
- Sunshade/ rain shade.
- Oil filing hole with screw cap and drain plug.
- An oil sight gauge comprising a flat toughened glass window through which the oil is viewed. The viewing window shall have a white background.
- Silica gel breather suitable for 10KVA transformer to be located inside the upper cabinet of T/R unit.
- A removable dial type thermometer graduated in degrees Celsius with a red mark on the scale at the maximum oil temperature.
- Thermometer pocket
- Locatable control cabinet with viewing window to IP-55 as a minimum.

Accessibility shall be provided by hinged and removable front and back shutters. A plexi glass viewing window shall be provided at the front shutter to allow the meters to be read without opening the front shutter. One drawing pocket shall be made at inner side of the front shutter. One holder for 5W LED lamp connection shall be provided at a strategic point inside the cabinet to facilitate proper illumination during operation and maintenance. The enclosure shall be supplied with an engraved warning level with the words "DANGER". Two junction boxes shall be provided at both sides of the upper compartment, one of them A.C. cable entries and other for D.C. cable entries. Gland plate should be provided against each junction box for fixing single compression cable glands for A.C DC control/monitoring cables. One 240V, 5A Socket shall be provided at a strategic point inside the cabinet to facilitate connection of soldering iron during maintenance. After fabrication the entire enclosure shall be sand blasted to SA 21/2 surface to surface or chemically treated with Industry Standard 7 Tank treatment process. An inorganic zinc primer shall then be sprayed to a total thickness of 3 mils. The finish coat shall be a dark grey shade of polyamide cured epoxy in three coats to achieve total thickness of 10 mils. Alternatively Powder coating of total thickness 100-125 Microns is also acceptable.

3.1.16 ENCLOSURE EARTHING

All normally dead metallic parts shall be electrically continuous, earthing terminals shall be suitable for 35mm square cable connection, one earthing terminal shall be made for earthing connection to power supply earthing and two earthing terminals shall be made for earthing connection to the local earthing pits.

The earth connection points shall be protected against corrosion. It shall not be necessary to scrape the paint away in order to make an effective earth connection. Provision shall also be made adjacent to each gland plate for cable gland earthing connection.

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3.1.16.1 Cable Terminations

i) Cable glanding and terminating facilities and terminals shall be suitable for the specified cable type and conductor size. Consideration and provision shall be taken by the manufacturer on the equipment design for the use of cables with aluminium conductors. Cable glands & cable lugs shall be in the scope of supply for CP system installation contractor.

i) Terminal blocks shall be arranged and positioned to afford easy access for carrying out external cable termination, testing, inspection and maintenance. There shall be ample clear space allowed between the terminal block and the gland plate for the spreading and termination of external conductors.

iii) All terminal blocks shall be shrouded or provided with transparent covers. Pinch screw type terminals are not acceptable.

iv) Three positive and three negative post type DC output terminals shall be provided for the T/R Unit. Each post shall be fitted with double nuts and washers.

v) Terminals for different voltages shall be separated by partitions.

vi) A terminal box or chamber with undrilled gland plate or entry panel of sufficient dimensions to terminate the specified incoming and outgoing cables shall be provided. Direction of cable entry shall be from below.

vii) Termination of single core cables shall be through a suitable gland plate and provision made for bonding and earthing any armour and/ or concentric ground conductors.

viii) Cable terminal arrangements for power and control cables may be integrated provided that a barrier separates the two.

ix) Auxiliary wiring shall have copper conductors of the manufacturer's standard sizing (subject to Buyer's approval).

x) Suitable terminals for three nos. ref. cell cables, one no. measurement cables and a selector switch for permanent ref. cell to be provided for T/R unit panel for connection to PSP meter. Wiring shall be crimped using self-insulated compression type terminal blocks which shall be suitably identified. Conductors shall be fitted with sleeve ferrules bearing the same identification as the terminal to which they are connected. Minimum conductor size shall be 1.0mm2 (current density shall not be more than 3A/mm^2 for copper conductor). However, Electronic wiring can be done with 0.5 mm^2 conductor.

3.1.17 NAME PLATE

A permanently stamped stainless steel metal plate shall be attached to outside of the case with the following information.

a. Manufacturer's name

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b. AC input voltage and current rating

c. AC frequency
d. Phase
e. Output DC Volts and Amps. rating
f. Weight in Kg of T/R unit
g. Model number
h. Serial number
i. Year of Manufacture

3.1.18 SPECIFICATION OF 75V, 50A T/R UNIT

A. AC input voltage : 240 Volts ±10% 50 Hz single phase
B. AC input Current : 30A (Max.)
C. DC power output : 3.75 KW (Max.)
D. KVA rating of transformer : 7.5KVA
E. DC output voltage : 75V
F. DC output current : 50A

G. Current rating
- Diodes: 100A(Max. Average forward current)
- SCR : 85A(Average on state current), 133A (RMS on state current)

H. Full load efficiency
- Transformer alone : More than 95%
- Transformer Rectifier Assembly : More than 75%

I. Full load power factor : 0.8 lagging
J. Insulation level : 2KV
K. Peak Inverse Voltage
- Diodes/SCR's : 1500V(PIV)

L. Filtering circuit : L.C.filter
M. Ripple and Hum at rated output : Not more than 5% RMS

N. Surge Diverters
i) For diodes/SCR's : R-C circuitry of rating as advised by manufacturer of SCR/ Diodes or MOV
ii) For input of T/R unit : 2 nos. Zener Diodes of voltage rating 300V RMS, spark over voltage 1000V(Peak), RIR Type A6 FMR 100 BB or equivalent MOV type surge diverters.
iii) For output of T/R : 2 nos. Zener Diodes of voltage unit rating 300V RMS, Spark over voltage 800V(Peak), RIR Type A6 FMR 80 or equivalent MOV type surge diverters.

O. Lightening arrestor: 2 nos. each at the input and output of the T/R unit of voltage rating 500V RMS, Max. 1.2/50 micro Seconds impulse spark over voltage 2.5KV(Peak), Max. discharge residual voltage at 5KA, 8/20 micro second impulse current wave 2.5KV @1.5KA, Max. impulse current discharge capacity 4/10 micro second impulse current wave 10KA(Peak), LAMCO PL01 L.T-2.8 or equivalent make.

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P. Protection : MCB suitable for motor load having thermal over load and magnetic short circuit Protection for input current in addition to separate HRC fuse protection for each Diode, HRC fuse

at out put and input terminals, glass cartridge fuse, in the live line of all lamps, auxiliary power lines to control circuit and voltmeter circuits.

Q. Construction : Plinth mounted outdoor type.

R. Cooling : Oil cooled

S. Meters/ Instruments: As per Sec.3.1.13.

1No.DC voltmeter 0-200V,
1No.DC Ammeter 0-60A
1No.AC voltmeter 0-300V
1No. AC Ammeter 0-30A
1No.Corrosionvoltmeter,0-19.99V,10Mohm input resistance.

Other accessories:

a) Silica Gel Breather
b) Dial type thermometer 8 Dial 2 1/2" graduate in degree celsius with one red mark on the scale at the maximum oil temperature.
c) Thermometer Pocket
d) Oil filling screw cap and drain plug.
e) An oil sight gauge comprising a flat long head glass window with white back-ground through which oil is viewed.
f) Sun shade/rain shade.

T. Enclosure: Per sec. 3.1.15

U. Cable Entry: Through single compression Aluminium gland of following sizes of cables. Gland plates are to be provided at the junction boxes located at both side of upper compartment:
+ve and -ve header : $95mm^2$/ $50mm^2$ 1-core, 4nos.
Power supply cable : $25mm^2$, 3-core, 1 No.
Monitoring cable : $6mm^2$, 1-core, 3 nos
(Monitoring cable to be used in case permanent ref.cell is used for monitoring pipe/ structure to soil potential)

V. Enclosure painting : As per sec. 3.1.15

W. Fabrication, Schematic: Supplier to furnish for EIL approval schematic wiring diagram and fabrication drawing prior to fabrication of T/R units.

X. Spare parts & Additional features : Supply as per Sec.3.1.18.

Y. Ambient temp. : 45 deg.C

Z. Type of control required in Auto mode: Constant current control and constant voltage control (AVCC MODE)

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3.1.19 DATA SHEET OF 50V, 25A T/R UNIT

A.	AC input voltage single phase	:	240volts±10%50HZ B.
B.	AC input current	:	10A (max.)
C.	DC power output	:	1.25KW (max.)
D.	KVA rating of transformer	:	2.5 KVA
E.	DC output voltage	:	50V
F.	DC output current	:	25A
G.	CurrentratingSCR:50A (Average onstate current),75A(RMS onstate current)		

Rest same as3.1.18exceptin item(s) where meter rating shall be as under

1No.DC voltmeter0-60V,
1No.DCAmmeter0-30A

1No.AC voltmeter0-300V

1No. AC Ammeter0-10A
1No.Corrosionvoltmeter,0-19.99V,10Mohm input resistance.

3.1.20 Testing of T/R units

All T/R units shall be tested by contractor and inspected by EIL/Owner before despatch, testing shall be conducted in accordance with codes and standards enclosed in this document, as per routine tests done by manufacturer and additional tests as mentioned below:

3.1.20.1 Efficiency test of Transformer Rectifier Assembly at 25%, 50%, 75% and 100% rated output current both in Auto and manual mode of operation.

3.1.20.2 No load output voltage test in Manual mode for each voltage setting using coarse and fine tap switches at rated input voltage of 240V AC.

3.1.20.3 Output voltage and current test in Manual mode for each voltage setting using coarse and fine tap switches for the following conditions.

i) Input voltage 240V AC,load resistance1.5 ohm for 50A T/ R& 2.0ohm for 25AT/R

ii) Input voltage 264V AC,load resistance1.5 ohm for 50A T/R & 2.0ohm for 25AT/R

iii) Input voltage 216V AC,load resistance1.5 ohm for 50A T/R& 2.0ohm for 25AT/R.

3.1.20.4 Output voltage test at rated output current setting in Auto mode for the following conditions.

i) Input voltage 240V AC,load resistance:1.5ohm for 50A T/R & 2.0ohm for 25AT/R

ii) Input voltage 264V AC,load resistance:1.5ohm for 50A T/R & 2.0 ohm for 25AT/R

iii) Input voltage 264V AC,load resistance 0 ohm (short circuit across +ve and-ve terminal of T/R unit). Set back up control 50A & 25A for 50 A & 25A T/R unit respectively.

iv) Input voltage 216V AC,load resistance:1.50 ohm for 50A T/R & 2.0 ohm for 25A T/R

Output current and voltage shall be recorded for each of above conditions (i) to (iv).

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3.1.20.5Heat run test for max. Temp rise to be conducted for main transformer, Autotransformer, filter choke, Diodes and SCR's, at 50A output current for 50A T/R Unit & 25A current for 25A T/R unit for 24hours continuous operation . Number of T/R units to be considered for Heat run tests and actual duration for which test to be conducted up to 24 hours (max.) shall be decided by EIL and owner. Thermocouple instrument shall be used for measurement of temperature. The sensors shall be clamped at different locations inside the closed T/R unit cubical and the cable of the sensors shall be connected to temperature indicator through a selector switch outside the T/R unit cubical during heat run test.

3.1.20.6 Insulation resistance test using 500V megger for Auto transformer and Main transformer between primary and secondary, primary and earth, secondary and earth.

3.1.20.7 Dielectric strength test using 2KV for 1 min. duration for Auto transformer, main transformer between Primary and secondary, primary and earth, secondary and earth.

3.1.20.8 Polarity test in Auto and manual mode of operation of T/R unit.

3.1.20.9 Calibration test for all Ammeters and volt meters.

3.1.20.10 Auto mode over load protection test:

Set back up control at 50 Amp. and increase current from zero to max. Possible using main Auto control for T/R Unit having constant current control. In case of Auto PSP control T/R unit ref. feed back signal to be varied from min. to max. set potential of T/R unit using battery & rheostat in place of ref. half cell signal, current during the test should not exceed more than 50A in both cases.

3.1.20.10.1 Constant Current Test

i) D.C Current Regulation against variation in AC Input

Put the unit in constant current mode and set the output current at 50 A by the help of current setting potentiometer and observe the variation in, if any, of output current with variation of AC input voltage at the steps keeping the output load constant: 216V, 240 V, 264 V.

ii) D.C Current Regulation against variation in Load Voltage

Keeping the AC input voltage at 240 V constant , set the output D.C current at 50 A and observe for any variation of DC current with variation of output load voltage at three different values ensuring that at each output load voltage, taking care voltage limit set value is not exceeded.

Repeat the above at 50A and finally at 25A set output current.

3.1.20.11 Constant voltage test for control circuitory. Supply voltage of T/R unit to be applied 240V 216V and 264V.

For each input supply voltage the reference voltage, +ve DC and -ve DC voltages of Auto mode control circuit to be checked whether they are constant.

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3.1.20.11.1 D.C Voltage Regulation against variation in Load Current

Keeping the AC input Voltage at 240 V constant, set the output D.C voltage at 75 V and observe for any variation of D.C Voltage with variation of output load current at three different values ensuring that each output load current, current limit set value is not exceeded .

Repeat the above at 24 V and finally at 12 V set output Voltage.

3.1.20.12 Ripple factor test

T/R unit shall be operated at full load both in Auto and Manual mode. In each case ripple voltage to be checked on a cathode ray oscilloscope (CRO). Peak to Peak ripple wave from shall be limited within 10.5 volt in CRO screen for7 5 volt TR unit & 7.0 volt for 50 volt TR unit.

3.1.20.13 Annunciation check:

Annunciation check to be done for power on, manual mode operation and auto mode operation.

3.1.20.14 Auto mode constant PSP operation test:

Connect one battery with variable rheostat in place of reference cell feedback signal and conduct the following test:

i) Make both T/R unit set potential & feedback signal from battery 1.0V, Switch on T/R unit & note T/R output current. Increase feedback signal from 1.0V to 1.5V and again bring back to 1.0V. Note change in the T/R output current.

ii) Conduct similar test as item (i) above with decrease of feedback signed from 1.0V to 0.5V and again back to 1.0V. Note change in the T/R output current.

of choke at 50A T/R unit output current =

3.1.20.15 Test certificate/ documents in 6 copies are to be furnished by vendor before despatch of T/R unit to site. The test certificate shall contain results for the tests from 3.1.20.1 to 3.1.20.14 given above in addition the following observations:

- Sl. No. of T/R unit
- D.C. output rating of T/R unit
- External dimensions of T/R unit
- Weight of T/R unit
- Thickness of M.S .sheet steel used for T/R unit enclosure.
- Painting details of enclosure.
- Visual inspection details of T/R unit stating:

a) All components of T/R unit are as per specification

b) All items are labeled properly for identification purpose.

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c) Number used in ferrules of cable leads are matching with schematic/ wiring diagram of T/R unit furnished.

3.1.22 DRAWINGS/ DOCUMENTS

Following drawings/ documents shall be furnished by vendor within 15 days from award of contract for approval of the same by EIL/ OWNER before starting of fabrication. Approved drawings after incorporation of comments (if any from EIL/ OWNER shall be furnished in 6 copies alongwith reproducible during the delivery of T/R units:

3.1.22.1 Fabrication drawings and data sheet of T/R unit giving dimensions, rating, weight, including installation/ foundation arrangement details.

3.1.22.2 Front view and typical sections of T/R unit panel with arrangement of equipment, control, protection and metering.

3.1.22.3 Data sheet of all accessories and circuit element of T/R unit including ratings.

3.1.22.4 Schematic and wiring diagram of T/R unit circuitory giving Auto/ Manual Mode of control including circuit details of all control cards.

3.1.23 INSTRUCTION BOOK

3.1.23.1 The instruction book in 10 copies shall be presented in such manner as to enable it to be used by personnel who are unfamiliar with the operation and maintenance of the T/R unit. The instruction book to be furnished along with supply of T/R unit.

3.1.23.2 CONTENTS

The instruction book shall contain

- A description of the T/R unit.
- Instruction for the installation, testing commissioning and safe operation and maintenance.

The information shall be presented as follows:

1. Index of contents

2. General description giving brief description of the T/R and its use.

Detailed description of T/R unit

This description shall include the technical characteristics, physical and mechanical limitations, and item wise the components, accessories and spare parts.

4. Description of the operation of the T/R unit. This description shall be clear, concise and in

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a logical sequence, using schematic diagram, wiring diagram and fabrication drawing.

5. Procedures for testing and adjusting the T/R unit:

The complete procedure for testing and adjusting the T/R unit during plant operation, periodic maintenance and overhaul shall be covered.

6. Maintenance Instructions:

This section shall be divided into two parts:

a) Preventive maintenance which shall indicate the periodic inspection required the inspection procedure and cleaning procedures.

b) Break down maintenance which shall include instruction for trouble shooting of the electrical circuits. The procedure for the removal and replacement of all parts listed as spares shall be given.

7. Spare parts

The instruction books shall give all the necessary details so as to procure all the spare parts from the manufacture or from open market.

8. Each instruction book shall be accompanied with one set of final approved Drawing/ documents as listed vide item 3.1.21.

- COVERING OF THE INSTRUCTION BOOKS: The instruction book shall be presented in a stiff covered binder with the following information printed on the cover:
    - the client's name
    - the location of the installation
    - the name of the installation
    - the title of the instruction book.

3.1.24 Following additional features are to be provided with T/R Unit

i) T/R UNIT INTERRUPTION

The T/R units shall have programmable current interruption facility according to a schedule defined by the user through the Central Monitoring and Control System. Interruption ON / OFF cycle should be programmable in the time ratio selectable from 0 to 9999 seconds in increments of 1 second. The interruption device shall be solid state type without any mechanical moving parts and shall have arrangement for bypass.

The interrupter clock of TR Unit should accept external time synchronization signal from the

central monitoring system having GPS synchronized current interrupter for measurement and recording of interrupted OFF potential recording in synchronization with other T/R units.

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ii) ANNUNCIATION FOR FUSE FAIL

T/R unit should be provided with Electronic Fuse fail Indicator. The Fuse fail indicator should sense signals from each Fuse in series with diode in the rectifier circuit as well as each fuse in DC

output circuit and on its failure, it should identify the fuse failed with the help of an independent LED for each fuse for local visual alarm.

iii) MANDATORY SPARE PARTS

Mandatory spare parts as mentioned at Section 4.0 in this document need to be supplied for the T/R Units.

IV) T/R UNIT REMOTE MONITORING

T/R Units should be provided with transducers for providing 4-20 mA output signals or direct signals as required for remote monitoring unit (RMU) interface for remote monitoring of T/R Unit output voltage and current. Alternatively, if this feature is built into the RTU, then separate transducers are not required in the T/R unit.
Necessary terminals are to be provided at suitable locations of the T/R unit panel for easy termination of onward wiring by others for remote monitoring purpose.
Each T/R Unit shall accept set point signals for DC Voltage and DC Current from Remote Monitoring & Controlling Panel and accordingly shall control its output from 0 to 100%.

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3.2 SPECIFICATION FOR CP SYSTEM POWER DISTRIBUTION BOARD (PDB)

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3.2 Power Distribution Board (PDB):

The Power distribution board (PDB) shall be plinth mounted outdoor type and shall be installed at non-classified locations near a single or group of T/R Unit under a sun/ rain shed. The enclosure of shall be IP-55 as per relevant IEC/ NEC/ IS codes.

The Power distribution board (PDB) shall be composed of one no.3 phase, 4-wire 250A/ 63A, incoming MCCB and 12/3 no. 1 phase, 63A outgoing MCB for input power supply to TR Unit as well as 6No.6A outgoing MCB for central monitoring system power supply. The incoming switch shall be 3-pole and outgoing switches shall be 2-pole. 4 Nos. of 25x 5mm tinned copper bus bar shall be used which should be taped by PVC tape of red, yellow and blue colours for dentification of the three phases and black colour for neutral. Wiring inside PDB shall be done using $50mm^2$, 1-core, copper conductor, PVC insulated, unarmored cable between TPN switch neutral and neutral bus whereas rest of the wiring shall be done by $25mm^2$, 1-core, copper conductor, PVC insulated unarmored cable. All single core cables shall be used red, yellow and blue coloured for phase connections and black coloured for neutral connection. All cables terminations shall be through Tinned copper cable lugs of matching cable size. All cable entries to the PDB panel shall be through Aluminium single compression glands. One gland for $300mm^2$ / $50mm^2$, 3-phase, 4-core incoming cable connection shall be provided at left side bottom of the panel, 12/3/6 glands to be provided at right side bottom of the panel for outgoing cable connections for 63A PDB. The outgoing cables shall be $25mm^2$, 1-phase, 3-core Aluminum conductor cables for TRU power input and $16mm^2$, 1-phase, 3-core Aluminum conductor cables for central monitoring system power supply. Size of the PDB Panel enclosure shall be adequate to accommodate all components easily and shall be made of 12 SWG sheet steel. Two nos. hinged front shutters shall be provided. The shutters shall be screwed to the panel enclosure structure at the centre in addition it shall have lockable handles. Painting details of inside and outside surfaces of the PDB panel shall be as follows: After fabrications the entire enclosure shall be sand blasted to a SA2½ surface. An inorganic zinc primer shall then be sprayed to a total thickness of 3 mils. The finish coat shall be of polyamide cured epoxy in three coats to achieve total thickness of 15 mils. The finish coat shall be a dark grey or yellow shade as per choice of EIL/ OWNER.

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3.3 SPECIFICATION FOR MIXED METAL OXIDE COATED TITANIUM TUBULAR ANODE FOR CP SYSTEM

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3.3.1.0 Scope

3.3.1.1 Anodes

Mixed Metal oxide coated Titanium tube anodes shall be dimensionally stable and will be supplied with anode lead cable connected to it.

3.3.1.2 ANODE DATA SHEET

Sl.No.	Description	Details
1.	Anode Type	Dimensionally stable Anode (DSA)
2.	Anode Shape & Dimension	Hollow Tubular 750mm long x 25.4mm OD, W.T: 1 mm ± 0.1 mm
3.	Anode weight	0.210 kg ± 5%
4.	Anode Material	Titanium seamless tube of Grade 1, ASTM B 861, overlayed with mixed oxide of noble metals.
5.	Anode design life	30 years
6.	Anode consumption rate (Kg/A-yr) at 100 A/m^2 Current density	2 mg/A-yr.
7.	Metal Oxide coating thickness weight (gm/M^2)	6 gms/m^2(at 100 A/m^2 for 30 years design life)
8.	Optimum Recommended anode current density (A/m^2) i) With Carbonaceous backfill in soil ii) Without backfill in soil iii) Fresh water	 $100A/M^2$ Vendor to furnish Vendor to furnish
9.	Rated current output	6 Amps
10.	Anode Centralizer for 8" NB casing pipe	1 Nos. per anode. Vendor to furnish details.
11.	Mechanical & Physical Properties: i) Electrical Resistivity (ohm Cm) of Metal Oxide ii) Contact resistance of anode to cable iii) Pull out strength iv) Anode fabrication v) Anode to cable connection details vi) Anode to cable joint insulation details	 10^{-5} Ohm Cm 0.9 milli ohms (max.) 200 kg(min) or breaking strength of cable Vendor to furnish details Vendor to furnish details Vendor to furnish details
12.	Dead Weight for Anode	Each anode to be supplied with a dead weight. Details of the same to be furnished by vendor

Note: All information to be furnished by vendor as per data sheet shall be furnished with his offer.

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3.3.1.3 Anode Lead Cable

Anode lead cables to be connected between each anode and AJB shall be 7 strands, 10mm^2 stranded copper conductor, single core, unarmored, with a double insulation system. The primary insulation shall be 0.04/0.1 inch thick cross-linked polyvinylidene floride (PVDF) 1100 Volt grade. The secondary insulation shall be 0.065 inch thick high molecular weight polyethylene (HMWPE) sheathing jacket over the primary insulation. For anode lead cable, manufacturer should have minimum 7 years of manufacturing experience and having proven track record of minimum 5 years of successful performance. The minimum 5 years of performance certificate of this item for any hydro carbon industry /pipelines needs to be furnished by the contractor. The proposed make/model of these items being supplied by contractor shall be subject to acceptance as per sole discretion of EIL/Owner.

Anode to Lead cable jointing and insulation shall be done by using straight through jointing kit which is to be provided by anode manufacturer. Anode to Lead cable jointing and insulation shall be done at manufacturer's work shop.

3.3.1.3.1 Anode to Cable connection

Anode lead cable conductor shall be crimped with tubular anode at the center of anode or at the ends and shall be sealed to prevent ingress of water at the joint. Fabrication details of the joint including sealing arrangement and test procedure of the joint shall be furnished by vendor for EIL's approval before making the joints.

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3.4 SPECIFICATIONS FOR PERMANENT REFERENCE CELL

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3.4 SPECIFICATIONS FOR PERMANENT REFERENCE HALF CELL

3.4.1 For monitoring of soil side potential:

a. Type of ref. half cell : Cu/ $CuSO_4$ type.

b. Body : Impact resistance

d. Each reference shall be supplied in cotton bag of chemical backfill (as per manufacturer recommendation) and complete with 25 M (minimum) cable as per specification. Contractor to measure the actual length of measurement cable required at site during detailed engineering stage and cut the required length from cable drum so as to avoid cable-to-cable joint. Alternatively, moisture proof joints may be carried out at site by trained jointer with holiday testing with manufacturer reference cell cable.

e. Location of half cell : 150 mm from structure

f. Design life : 25 years

g. Stability : ±10 mv with 3 Micro- A load.

h. Make : Shall be suitable for 15-40 deg.C temperature application in sand.

i. Measurement Cable: 4-6mm^2, stranded Cu conductor, Single core, screened/ armoured, PVC insulated and sheathed, 1100 V grade.

Reference Cell Cable: 4-6mm^2, stranded Cu conductor, Single core, screened/ armoured, PVC insulated and sheathed, 1100 V grade.

Contractor shall get the electrodes approved before placement of order. For Reference cell, manufacturer should have minimum 7 years of manufacturing experience and having proven track record of minimum 5 years of successful performance. The minimum 5 years of performance certificate of this item for any hydro carbon industry /pipelines need to be furnished by the contractor. The proposed make/model of these items being supplied by contractor shall be subject to acceptance as per sole discretion of EIL/Owner.
Necessary test certificates from manufacturer giving calibration test, results, date of manufacture shall be furnished during delivery. Any delivery effected without prior approval of owner will be at suppliers risk & cost.

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3.5 SPECIFICATION FOR MIXED METAL OXIDE TITANIUM WIRE ANODE FOR CP SYSTEM

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3.5.1.0 MIXED METAL OXIDE TITANIUM WIRE ANODE

Factory coke backfilled fabric jacketed Mixed Metal Oxide coated Titanium wire anodes shall be a standard product of the manufacturer regularly engaged in the production of such anodes for use in impressed current Cathodic Protection system. The make / model of MMO wire anode being proposed by CP System contractor shall be subject to acceptance as per sole discretion of EIL / OWNER. The anode manufacturer should have minimum 7 years of manufacturing experience for the similar type pre-packed with coke-breeze MMO Ti Wire anodes and also proven track record for minimum five years of successful performance of such anode for UG Vessels protection for any hydrocarbon plant need to be furnished by the CP System contractor.

3.5.1.1 Anodes

Mixed Metal oxide anodes shall be dimensionally stable. Each wire anode shall be supplied with anode lead cable piggy back connected to it i.e there will be connection between the Primary anode and the internal header cable at every 3m (max) distance. The connection shall be multi- step and water proof.

Anode Data Sheet:

a.	Anode Type	Dimensionally stable Anode (DSA)
b.	MMO Anode Shape & Dimension	Wire anode 1.5 mm ± 0.10mm*
c.	MMO Anode weight	Vendor to Specify
d.	MMO Anode Material	Commercially pure solid Titanium wire, grade 1/2, ASTM B 863, over laid with mixed oxide of noble metals suitable for soil application
e.	Anode design life	30 years
f.	i) Anode consumption rate (Kg/A-yr.) at 100 A/M2 C. density. ii) Overall OD of anode string with calcined petroleum coke breeze and its fabric jacket enclosure	i) 2 mg/A-yr. ii) 35mm (min.)
g.	Metal Oxide coating thickness weight (gm/M2)	6gms/m^2(min.) / MMO coating on titanium suitable for current output and design life.
h.	Optimum Recommended anode current density (A/M2) i) With Carbonaceous backfill in soil ii) Without backfill in soil iii) Fresh water	i) 100A/m^2 ii) Vendor to furnish iii) Vendor to furnish
i)	Minimum rated current output in soil/ sand	50mA/m

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j)	Mechanical & Physical Properties i) Electrical Resistivity (ohm Cm) of Metal Oxide	10^{-5} Ohm Cm
k)	Contact resistance of anode to cable	0.9 milli ohms (max.)
l)	Anode fabrication	Vendor to furnish details
m)	Anode to cable connection details	100% water proof. Vendor to furnish
n)	Anode to cable joint insulation details	Vendor to furnish
o)	Allowable attenuation of potential along anode	1% for dry sand of resistivity 20,000 ohm-cm 10% for wet sand of resistivity 500 ohm-cm.
p)	Spacing between consecutive anode to cable joints	3 meters
q)	Coke breeze backfill	Vendor to furnish (as per manufacturer standard)
	Carbon content	99% min
	Coke Resistivity	< 1 ohm
	Bulk density of coke breeze	1180 kg/ m^3 min
r)	FABRIC	The anode wire with surrounding coke breeze should be held together by an Integrated woven, acid resistant and porous jacket assembly.
s)	**Chloride resistance**	**The fabric should pass the 6 month acid immersion test**

- Following Insulation specification to be followed for supply of anode internal header and anode lead cable. Laboratory testing to be done in national/ international reputed laboratory at anode manufacturing country.

Insulation Type	Insulation Specifications**	
Polyvinylidene Fluoride (PVDF) Irradiation Cross-Linked	Tensile Break Strength Break Elongation Flexural Strength Resistivity Dielectric Constant	4500 PSI min. 50% min. 8600 PSI min. 2×10^{14} ohm-cm min. 8.0 min. at 100 Hz
Ethylene Chlorotrifluoroethylene (ECTFE)	Tensile Break Strength Break Elongation Resistivity Dielectric Constant	6500 PSI min. 100% min. 1×10^{15} ohm-cm min. 2.5 min. at 1 Mhz
High Density High Molecular Weight Polyethylene (HMWPE)	Color Density (minimum) ASTM D1248, Type 3, Class C, Category 5, or IEC 60502-1 Temperature Rating	Black 0.941 grams per cm^3 90°C.

** Standard Test Method ASTM D638 shall be used to determine the tensile strength, flexural strength and break elongation. For the resistivity and dielectric constant tests, Standard Test Methods ASTM D257 and ASTM D150 shall be utilized.

Note: All information is required to be furnished by vendor as per data sheet and shall be furnished with his detail engineering package.

3.5.1.3 ANODE HEADER AND LEAD CABLE

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Anode internal header cable and anode lead cable in between each anode string and AJB shall be insulated, 7 strands, 8 AWG/ 10mm^2 stranded copper conductor, single core, unarmoured, with a double insulation system. The primary insulation shall be 0.04/0.1 inch inch **± 0.005 inch** thick cross-linked polyvinylidene floride (PVDF) 1100 Volt grade. The secondary insulation shall be 0.065 inch inch **± 0.005 inch** thick high molecular weight polyethelene (HMWPE) sheathing jacket over the primary insulation.

Jointing of anode lead cable with internal anode header cable and its insulation shall be done by using standard jointing kit which is to be provided by anode manufacturer. However, preference will be given for direct termination of the anode header cable to AJB without any joint in between with internal anode header cable and anode lead cable. Anode lead cable to anode header cable jointing, shall be done at site by a trained cable jointer in case of unavoidable site/ project situation.

3.6.1.3.1 Anode to Cable connection

Vendor should submit procedure and sealing arrangement drawing of the joint and get the Anode lead cable to anode internal piggyback cable joint approved by EIL/ OWNER.

3.5.1.4 QA/ QC for Anodes

Following tests are to be conducted by anode manufacturer. Anodes with cables shall be delivered to site only after EIL/ Owner's approval of the test results, which are to be furnished by anode manufacturer. Detailed procedure for conducting the following tests shall be furnished by manufacturer for EIL/ Owner's approval before commencing tests. All the tests should be conducted in presence of EIL/ OWNER/ TPI (as applicable).

3.5.1.4.1 Visual Inspection Test –

The anode assembly shall be visually inspected for proper compaction of coke breeze and centralization of MMO wire and cable .

3.5.1.4.2 Dimensional check

- Dimensional check of MMO wire anode and OD of complete anode assembly
- Dimensional Check of Anode internal piggyback cable

- Thickness of primary cable insulation
- Thickness of secondary cable insulation

3.5.1.4.3 MMO Wire Anode (Type Test)

- MMO coating loading/ thickness by XRF or SEM method
- Accelerated Life Test NACE TM0108 (latest version)

3.5.1.4.4 Coke Breeze (Type Test)

- Coke Breeze Resistivity as per ASTM G57-06
- Weight of coke breeze per meter of anode

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3.5.1.4.5 Anode Fabric (Type Test)

- Acid Immersion Test for 6months (5N HCl Solution)

3.5.1.4.6 Anode Lead cables (Routine tests)

Routine & type test certificates of cable manufacturer to be furnished for anode lead cable as per IEC std. Cable length and identification tag to be verified by measurement.

3.5.1.4.7 Anode to Cable joint test (Routine tests)

Sample anode lead cable to internal anode header cable joint shall be tested for its electrical contact resistance & its value in ohms shall be recorded.

3.5.1.4.8 a) Prototype Test

First anode string / loop shall be subjected to destructive test to determine pull out strength of cable

to anode joint as well as effectiveness of the joint insulation and coke breeze backfilling to be performed at manufacturer's factory or at site (as applicable).

b) Type Test Frequency: - The type test frequency shall be 3 years or in case of any change in the material whichever is stringent

3.5.1.4.9 Test Reports

After conducting each test, reports showing test results should be submitted to EIL/ Owner for approval. Anode/ cable identification No./ batch No. shall be mentioned in test results against each test result. Any delivery made to site before getting EIL/Owner's approval of test reports shall be at manufacturer risk & cost.

3.5.1.4.10 Anode Fabrication

Manufacturers/ supplier shall furnish detailed dimensioned fabrication drawing of anode as well as details of cable connection and its insulation sealing to EIL/ Owner for approval.

Vendor (Anode Manufacturer/ supplier) shall furnish following information for approval before commencement of Anode to cable joint.

- Procedure for making the entire anode to cable joint.
- Procedure for accelerated ageing test of the string anode or test results.

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3.6 JOB SPECIFICATION FOR ANODE, CATHODE & MONITORING JUNCTION BOXES FOR CP SYSTEM

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3.6.1 Specifications for Anode & Cathode Junction Boxes

3.6.1.1 Anode Junction Boxes and Cathode Junction Box cum test station shall be suitable for Classified Area applications

An anode lead junction box (AJB) will be provided to feed T/R Unit output current to anode strings. These junction boxes will have provision for independent current measurement of each anode output. This will be accomplished by means of individual shunts for each anode circuit.

Drainage cable, reference cell cables and measurement cables from each structure/ equipment shall terminate in its respective cathode junction box cum test station. All the above-mentioned reference cell cables and measurement cables from each CJB shall be terminated into a single Monitoring junction box (MJB). Each CJB shall be connected to the negative terminal of the each T/R unit through loop in loop out arrangement for return of drainage current from structure/ equipment to the T/R unit.

The enclosure of CJB shall be structure/ wall mounted type. Shutter should be provided with closed cell neoprene sealing gaskets. The terminal board shall be of 10mm WT Phenolic laminated sheet on which all terminals and shunts are to be mounted. The terminals shall be made of cadmium plated steel or stainless steel stud nut and washers of M-10 size for termination of anode and cathode lead cables and M-4 size for termination of reference cell and measurement cables. All cable entries shall be through Aluminium double comprehension glands. The external bolt, nuts and clamps to be used for mounting the junction box with back plate/structures shall be MS electro-galvanised or Cadmium plated.

For classified areas, Junction box enclosure shall be of type "Exd" protection Zone 2/Group IIA/IIB application, Temp. Class: T-6, as per IS 5571,5572,2148 & 8289 and relevant IEC/NEC/IS standards. The cable glands shall be FLP double compression type made of Aluminium. Enclosure need to be certified by CMRI. The shutter of the junction box shall be screwed to the body of junction box by using MS electro galvanised/ Cadmium plated nut, bolt and washers. The enclosure of the junction box shall be made of cast aluminium. One earthing terminal shall be provided for earthing the junction box.

3.6.1.2 Monitoring Junction Boxes for non Classified Areas:

Monitoring junction boxes (MJB) will be installed near the T/R Unit and shall be required for monitoring potentials of multiple structure/ equipment . The enclosure for the MJB shall be of IP-55 construction made of 12SWG (2.67) W.T. sheet steel.
The enclosure shall be structure/wall mounted type having removable hinged front shutter with one handle and flush type locking arrangement. Shutter should be provided with closed cell neoprene sealing gaskets. The terminal board shall be of 8mm thick Phenolic laminated sheet on which all terminals shall be made of stainless steel stud, nut and double spring washers of M-4 size for reference cell/ measurement cables. The terminal arrangement shall be such that bottom row is utilised for termination of measurement cables from each structure/ equipment and upper rows one each is allotted for the reference cell cable termination from each structure/ equipment , hence total number of rows shall be one more than the total number of structure/ equipment. All cable entries shall be through Aluminum double compression glands. The external bolt, nuts and clamps to be used for mounting the junction box with back plate/ structures shall be MS electro-galvanised or Cadmium, plated. Shutter should be provided with closed cell neoprene sealing gaskets.

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3.6.1.3 Proper fitting of cables at cable glands

It is essential that all cables should fit tight at cable glands. For this purpose vendor need to make openings for glands at junction box or cast/ procure cable glands as per cable samples to be procured for CP System.

3.6.1.4 Painting

Enclosures of all non classified type anode and Cathode junction boxes shall be surface finished with paint as per guidelines outlined in Section 3.11.

3.6.1.5 Inspection & Testing

Fabrication drawing showing internal terminal arrangement of each type of junction box to be submitted by vendor to OWNER/ PMC to obtain approval for a Prototype construction. After inspection and approval of prototype the mass production shall be started. Calibration test for shunts for each junction box to be inspected by OWNER/ PMC before dispatch.

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3.7 SPECIFICATION FOR CABLES FOR CP SYSTEM

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3.7.1.0 SCOPE

3.7.1.1 CODES AND STANDARDS

In general the cables covered by this specification shall unless otherwise specified be in the line with the requirements of any of the latest applicable standard of IS, IEC, BS and Relevant NEC/ JIS/ JEC standards. Wherever the requirements in this specification are in conflict with any of the above standard, the requirements under this specification shall be binding.

3.7.1.2 ANODE LEAD CABLE

Anode lead cables shall be 7 strands, 10mm^2 stranded copper conductor, single core, unarmoured, with a double insulation system. The primary insulation shall be 0.04/0.1 inch thick cross-linked polyvinylidene floride (PVDF) 1100 Volt grade. The secondary insulation shall be 0.065 inch thick high molecular weight polyethylene (HMWPE) sheathing jacket over the primary insulation.

Insulation Type	Insulation Specifications**	
Polyvinylidene Fluoride (PVDF) Irradiation Cross-Linked	Tensile Break Strength Break Elongation Flexural Strength Resistivity Dielectric Constant	4500 PSI min. 50% min. 8600 PSI min. 2×10^{14} ohm-cm min. 8.0 min. at 100 Hz
Ethylene Chlorotrifluoroethylene (ECTFE)	Tensile Break Strength Break Elongation Resistivity Dielectric Constant	6500 PSI min. 100% min. 1×10^{15} ohm-cm min. 2.5 min. at 1 Mhz
High Density High Molecular Weight Polyethylene (HMWPE)	Color Density (minimum) ASTM D1248, Type 3, Class C, Category 5, or IEC 60502-1 Temperature Rating	Black 0.941 grams per cm^3 90°C.

** Standard Test Method ASTM D638 shall be used to determine the tensile strength, flexural strength and break elongation. For the resistivity and dielectric constant tests, Standard Test Methods ASTM D257 and ASTM D150 shall be utilized.

3.7.1.3 +VE, -VE HEADER CABLE

+ve header and -ve header cables shall be 95mm2, stranded Aluminium conductor, single core, Aluminium wire armoured, PVC insulated and PVC sheathed 1100V grade cable.

3.7.1.4 DRAINAGE CABLE

Drainage cables shall be 50mm2, stranded Copper conductor, single core, Aluminium wire armoured, PVC insulated and sheathed 1100V grade cable.

3.7.1.5 POWER SUPPLY CABLE (Between PDB & T/R Unit)

Power supply cable between Power source or CP System DB and T/R unit shall be 25mm2, stranded Aluminium conductor, 3-core, Aluminium wire armoured, PVC insulated and sheathed 1100V grade cable.

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3.7.1.6 POWER SUPPLY CABLE (between Power Source & PDB).

Power supply cable between Power source & CP System DB shall be 300mm2 /50mm2, stranded Aluminium conductor, 4-core, Aluminium wire armoured, PVC insulated & sheathed 1100 V grade cable.

3.7.1.7 EARTHING CABLE

Earthing cable shall be 35mm2 , stranded Aluminium conductor, 1-core unarmoured, PVC insulated and sheathed 1100V grade cable.

3.7.1.8 REFERENCE CELL / MEASUREMENT CABLE BETWEEN REFERENCE CELL / UG VESSEL TO CJB CUM TEST STATION

Instrumentation cable, 4mm^2, 1-core, stranded copper conductor, PE/PVC insulated and PVC sheathed, screened and armoured cable, PE/PVC insulation of each core shall be Numbered or colour coded for easy identification of each core.

3.7.1.9 REFERENCE CELL / MEASUREMENT CABLE BETWEEN CJB TO MJB & MJB TO TRU

Instrumentation cable, 2.5mm^2, 10-core, stranded copper conductor, PE/PVC insulated and PVC sheathed, screened and armoured cable, PE/PVC insulation of each core shall be Numbered or colour coded for easy identification of each core.

3.7.1.10 REFERENCE CELL / MEASUREMENT CABLE BETWEEN MJB & RTU

Instrumentation cable, 2.5mm^2, 20-core, stranded copper conductor, PE/PVC insulated and PVC sheathed, screened and armoured cable, PE/PVC insulation of each core shall be Numbered or colour coded for easy identification of each core.

3.7.1.11 REFERENCE CELL / MEASUREMENT CABLE BETWEEN TRU & RTU

Instrumentation cable, 2.5mm^2, 24-core, stranded copper conductor, PE/PVC insulated and PVC sheathed, screened and armoured cable, PE/PVC insulation of each core shall be Numbered or colour coded for easy identification of each core.

3.7.1.13 POWER SUPPLY CABLE BETWEEN PDB TO RTU FOR CENTRAL MONITORING

Power supply cable between PDB to RTU for central monitoring shall be 16mm2, stranded Aluminum conductor, 3-core, Aluminium wire armoured, PVC insulated and sheathed 1100V grade cable.

3.7.1.14 CABLE DRUMS

All cables to be supplied in wooden drums. Cable lengths in each cable drum shall be 600m (min.) wherever cable lengths are more than 600m.

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3.7.1.15 INSPECTION

All cables along with manufacturer's test certificate as per IS standards shall be inspected by OWNER/EIL at the vendor's shop before dispatch. Minimum 15 days advance notice to be furnished by vendor for this purpose. In case of any doubt OWNER/EIL may insist vendor to conduct the tests as per IS standards in presence of OWNER/ EIL at vendor's work shop or some third party reputed laboratory approved by OWNER/ EIL at no extra cost.

3.7.1.16 CABLE IDENTIFICATION

For easy identification of cable, the over sheath of the cable should have yellow colour and "CP SYSTEM CABLES" should be printed using black colour at one meter interval throughout the length of the cable.

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3.8 JOB SPECIFICATION FOR CALCINED PETROLEUM COKE BREEZE FOR CP SYSTEM

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3.8 SPECIFICATION FOR CALCINED PETROLEUM COKE BREEZE

Calcined Petroleum Coke Breeze shall conform to the following specifications as per latest NACE- SP 0572 std .

A	Chemical Composition:	
	Moisture (on Dry Basis)	< 0.1 (% by mass)
	Fixed Carbon	Minimum 99.0 (% by mass)
B	Bulk density	900 Kg/m^3 to 1200 Kg/m^3
C	Real density	2.03 gm/cc
D	Particle Size	1.00mm (max.), dust free
E	Resistivity	0.1 ohm-cm. at 150 psi.

3.8.1 Test Certificates

Test Certificate shall be furnished for the following:

1. Make of coke breeze
2. Batch no.
3. Chemical composition
4. Bulk density and Real density
5. Particle size analysis
6. Resistivity (ohm-Cm.) at 150 psi compaction

Any delivery effected without prior approval of test certificate by EIL/ Owner will be at suppliers risk & cost.

Above mentioned specification for coke breeze shall be considered for MMO tubular anodes incase required for supplementary design, the coke breeze to be considered for MMO wire anode may be of make as per the anode manufacturer's choice meeting the requirements of the specifications mentioned above.

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3.9 JOB SPECIFICATION FOR THERMIT WELDING FOR CP SYSTEM

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3.9.1 Thermit Weld Connection:

All cable-to-pipe connections shall be made utilizing the exothermic weld process. All thermit weld connections shall be encapsulated with thermit weld cap and flood coating of coal tar enamel. Each thermit weld connection will basically require the following:

- Thermit weld mold vertical/ horizontal
- Thermit weld metal
- Thermit weld cap Steel disc.
- Copper sleeve
- Flint Igniter
- Mold Cleaner
- Mold Packing
- Coal tar enamel/ two part epoxy resin for encapsulation of the joint.

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3.10 MATERIALS/ EQUIPMENT FOR OPERATION AND MAINTENANCE OF CP SYSTEM

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3.10 Materials/ Equipment for Operation and Maintenance of CP System:

Following materials/ equipment shall be supplied by the CP System Contractor for operation and maintenance of CP system.

S.No.	Quantity	Description
1.0	1 No.	Digital Multimeter having minimum input resistance 10 Mohm, complete with leads and leather case.
2.0	10 Nos.	Reference electrodes: Portable Copper/ Copper sulphate type having PVC SCH 40 body with transparent window and threaded ceramic porous plug suitable for 15-40 deg.C temperature application in sand.
3.0	1 No.	DC Clipon ammeter in milliamp. / micro amp. range current measurement.

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3.11 SPECIFICATION FOR PAINTING CORROSION PROTECTION FOR JUNCTION BOXES, PDB, CABLE MARKERS AND JUNCTION BOXES SUPPORT STRUCTURES

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3.11.1.0 Corrosion Protection for Junction boxes, PDB, Cable markers and junction Boxes support structures

All junction Boxes in Non-classified area, PDB and their support structures, MS channels for T/R mounting if any, cable marker Posts shall be galvanized & painted in following manner.

i) Surface preparation

Grit/shot Blasted to SA2 1/2 as per Swedish standard SIS 055900

ii) Galvanizing

Hot dip or spray galvanized to achieve a minimum zinc thickness of 150µm.

iii) Primer Application

Etch Primer with 10 µ DFT based on Polyvinyl Butyral resin + 1 coat of epoxy zinc phosphate primer @40 µ DFT/coat

iv) Paint Application

1 Coat of 2 Pack high build epoxy with Polyamide hardener cure @100 µ DFT/coat followed by 1 Top coat of Acrylic Polyurethane finish paint @40 µ DFT/coat.

Primer & Paint application procedure shall be standard airless spray and as per paint manufacturer's procedure. Name of Paint manufacturer and product should be approved by EIL prior to application. Colour of top coat shall be yellow or grey as per choice of EIL/ OWNER.

3.11.1.1 MS covers for shallow vertical Beds shall be painted with 2 coats of synthetic enamel paint of Asian Paint/Berger or equivalent make. Colour of paint shall be yellow.

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3.12 CENTRAL MONITORING SYSTEM

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CENTRAL MONITORING & CONTROL SYSTEM (RMC)

3.12.1 Common Computerized Central Monitoring and Control is required for the CP System for each TR unit/ items to be protected inside the Unit. For this purpose, the T/R unit & permanent reference cells should be connected to Remote Terminal Unit (RTU) consisting of microprocessor based CPS controller with alpha- numeric LCD display, memory, real time clock, keypad, battery backup and communication ports or equivalent PLC-SCADA system.

- RTU/ PLC system shall be capable to process minimum 8 analogue input signals (including one each for TR Unit output current & voltage), 4 digital input signals, 2 analogue output signals and 1no. digital output signal for monitoring performance of each TR Unit which shall be considered for structure/ equipment protection

- In addition to this some digital and analog (input) signal should also be kept as 20 % spare capacity.

- Single or multiple RTU/ PLC system may be provided for monitoring and control of all TR unit output and monitoring of potential for structures.

Thus considering few spares minimum analogue inputs, digital inputs, digital outputs and analogue outputs to be processed by each RTU/ PLC system is to be designed by vendor for review / approval by EIL/ OWNER. The system should also have inbuilt mechanisms to reduce / nullify induced AC interference voltages.

The RTU/ PLC Unit shall also be provided with 1 No. digital output for switching operation for TR Unit. This output shall be used to turn the rectifier OFF and ON for depolarised and instant "OFF" readings. The rectifier shall have in-built facility to accept these signals and interrupt its output supply. The digital input/ output channels shall be optically isolated. The RTU/ PLC should include a GPS based time synchronization unit for measurement of true OFF potential readings.

Further, RTU/ PLC shall be provided with 1 or 2 analogue output that can be used for controlling the various modes of the TR unit for remote control.

The RTU/ PLC should be capable of generating alarms when the parameter limits are violated and it should communicate the alarm data in real time and should not wait for the monitoring software query. The field RTU/ PLC units will have capability to control & monitor the T/R unit Voltage/ Current/ PSP & Current interruption by means of commands from the Central Monitoring Panel(CMP). The operator will be in a position to set all the parameters of T/R unit like DC Voltage, DC current, T/R unit current interruption timings/ schedules from the Central Monitoring Panel (CMP).

All CP System parameters shall be monitored and controlled from central control room using suitable software. The communication link between the RTU /PLC and Central monitoring and Control station should be cost effective GSM based wireless technology or RS485 fiberoptic/ Copper communication, whichever is decided by EIL/ OWNER as the communication network. CP System Sub-contractor should design, procure and install the requisite communication system and the cables required for this purpose.

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Central monitoring and Control station computer to be provided by the CP System sub- contractor shall consist of standalone computer suitable for CP monitoring application with following minimum specifications:

- Intel Core 2, I-7 (seven) processor
- Genuine Windows latest operating system with License
- 8 GB RAM
- 500 GB HDD
- 24in Flat Panel LCD Color Monitor
- DVD Rom
- Intel Integrated 100/ 1000 Ethernet Network Card
- 1 Serial, 4 USB Ports
- MS SQL Server Latest
- A3 Laser jet printer (HP make)
- Inbuilt UPS system which can operate up to 30 minutes on full load in case of power failure
- Other standard accessories

CP System sub-contractor shall also provide necessary Software for Remote Monitoring & Control as well as for printing of CP reports. The software should be compatible to Windows format and MS SQL Server or Oracle database (10g) with proper License should be used.

3.12.2 Remote Monitoring & Controlling Central Control System

The software and hardware for the proposed SCADA system shall have a proven track record of minimum three years of successful operation in the field of CP monitoring.

The Remote Monitoring & Control Panel (RMCP) shall have a Data Acquisition and Control Hardware operating in Real Time on PC having minimum specification mentioned in item 3.12.1

A Front End Communication Module (FEC) is also required that will be responsible for managing the entire communication traffic between the RMCP and RTU/ PLC.

The T/R Unit Output DC Voltage, DC Current, Reference Electrode Voltages, Alarms are to be extended to RMCP Panel through RTU/PLC units by any of the cost effective communication network such as GSM based wireless technology/ RS485/ fibreoptic/ copper communication whichever is decided by EIL/ OWNER as the communication network for data downloading and remote monitoring & control from master control room.

Each T/R Unit shall accept set point signals for DC Voltage and DC Current from Remote Monitoring & Controlling Panel and accordingly shall control its output from 0 to 100%.

- REMOTE MONITORING SYSTEM - SOFTWARE:

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The Remote Monitoring and Control System shall monitor and control various process parameters of Cathodic protection system. The Monitoring software shall be user friendly, Windows compatible, and should allow easy data transfer to other windows based applications or custom applications having ODBC compliant database. The Software shall have built-in graphic package to display graphical representation of the process on-screen with embedded buttons for switching ON/ OFF TR units. Data security should be ensured through three different types of Access Levels namely Expert, Supervisory and Operator. It should have provisions to accommodate future need of addition of new TRs for equipment as may be required from time to time.

If required by client, The software shall be compatible for interfacing of the available CP System monitoring data on LAN at 10 No. additional nodes for management information system for access and reporting for the management. The monitoring software should be capable of generating notification & visual alarm, as and when signals go outside programmed set points and during RTU/PLC failure and TR Unit input power failure. It should generate customized reports as decided by EIL/ OWNER. The software shall allow configuration of emails of OWNERS employees who are responsible for maintenance.

- Remote Terminal Unit – specifications:

Sl No	Parameter	Specifications
1	Model	As per manufacturer
2	Local display & Local Keypad	The RTU shall consist of a 3 x 6 matrix membrane keypad and a 16 x 2 LCD Display with back-lighting for entering local settings and viewing TR parameters locally. Following Local settings can be done using the Key Pad & Display : - Setting Date/ Time - Setting Periodic Logging Interval - Setting of Scaling factor for DC shunt rating - Setting levels for various Alarm notifications - Setting Field ID.
		The LCD will normally display - TR Voltage - TR Current - Reference Potential - AC supply Voltage The RTU/ PLC should be able to be remotely configured for most of the above parameters from the central station.

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3	Programmable Periodic Interval	The Periodic Logging & Broadcast interval is programmable from 1 reading per 5 Minutes to 1 reading in 24 hours.
4	CPU	Microprocessor based latest generation design. Built-in Real Time Clock (+/- 1 minute accuracy over one month) Watch dog timer which provides a reset signal to the CPU if not toggled due to any hardware or software failure to ensure fail safe operation.
5	Local Memory	The RTU/ PLC will have sufficient local NVRAM memory to store the monitored data locally. Logged Data shall also be stored in the internal non-volatile Memory of RTU. About 30,000 total Data readings should be able to be stored without downloading. The locally stored data should be retained for upto10 years without external power to RTU/PLC. It will be possible to download the locally stored RTU data on a field Laptop reader through the local communication port in the RTU/ PLC whenever desired.
6	Analog Inputs for each TR Unit- (8 T/R Unit parameters viz □ DC Voltage □ DC Current □ Ref. Cell Potential (5 No.) □ AC supply Voltage + spare)	Fully differential Inputs, 12bit /16-bit resolution Should nullify the effect of AC interferences. High accuracy, High Impedance, with high common mode rejection ratio CMRR. CH-1: 0 – 100V DC (For DC Output Voltage) CH-2: 0 - 100mV DC (For DC Output Current through T/R shunt) CH-3 to 7: -5.0V to +5.0 V DC (For 5 No. Reference potential) CH-8: 0 - 300V AC (For AC supply Voltage Monitoring)

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7	Digital Inputs or software for Alarm generation. As required by design	24/12 VDC operated. shall also continuously scan and check for Alarm conditions listed below Following Alarms will be generated using Digital Inputs : • Diode/Output Fuse Fail • Unit Working in Remote Mode • Unit working in Local Mode Following Additional alarms will be generated by Software : • Input AC Supply Fail • Under Protection for Each Ref Electrode • Over Protection for Each Ref Electrode • Reference Fail for Each Ref Electrode The set parameters for the above alarm conditions can be programmed remotely through the central PC
8	Analog Control Outputs for T/R unit control As required by design	4-20mA / 0-5VDC / 0-10 VDC with isolation of 2500Vrms. Resolution – 12 Bit
9	Digital Output – 1 No. For T/R unit Current Interruption	SSR outputs relay 2500 V RMS optical Isolation. Contact rating 2A@ 240 V AC/ 1A @200 V DC On / off delay times 3 msec.
10	Communication	Through RS485 over Copper/ Fibre Optics network for broadcasting data to the Central Station at the programmed periodic interval. E-mail message facility for abnormal condition notification.
11	GPS Interface	Each RTU/ PLC will have built-in GPS module to synchronise the RTC to GPS time. This will ensure uniform real time for all the RTU/ PLCs.
12	Power Supply	230V ± 20%AC, 50 Hz □ 20V to 70V DC □ 12 VDC (Any one type as required by design)
13	Battery Backup	Battery Back-up for up to 2 Hrs of un-interrupted operation including E-mail transmission, in the event of failure of AC supply.
14	Communication Ports	As required by design

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15	Protection	Short Circuit Protection Surge Protection using MOV. Over Voltage protection EMI / EMC protection
16	Mounting	Preferably inside TR Unit if not possible then Wall / Pole mounting
17	Operating Temperature range	0 to 55 deg C
18	Humidity	95% condensing
19	Time Stamping	The RTU/ PLC shall have precise, accurate Real Time Clock (RTC) for exact time stamping of data.
20	Enclosure	The RTU/ PLC shall be housed in a compact & sturdy non corroding enclosure suitable for installation inside the shed common for all TR units. ABS / M.S. With IP 55 degree of protection Mounting : Either mounting inside each TR unit or common for all TR unit located under a single shed with Plinth mounting arrangement. Cable Entry : From Bottom
21	Data Download Port	The RTU/ PLC Unit shall have USB port through which the logged data can be downloaded onto the laptop.
22	Centralised Monitoring	The RTU/ PLC shall have built-in fibre optic modem to communicate with the central station Through RS485 over Fibre Optics Communication network. The RTU / PLC shall send the TR Data with exact time stamp directly to the Master Computer at central station at the programmed Periodic Interval. At the central end a PC shall be installed with a fibre optic Front End Communication (FEC) module and centralized monitoring software. The RTU shall also send alarm information with exact time stamp to the central station Periodic Interval. The PC software shall accept the data received from the RTU/ PLC, display it in graphical and analytical formats and store it in database like MS SQL to generate Reports and Graphs. It shall also possible to remotely program the Field RTU/ PLC Unit through the Central PC for configuration details like Setting Date/Time, Setting/ changing Periodic Interval . PC software should be able to monitor and receive data from up to 50 field RTU/ PLC at a time.
23	Compliance	Relevant BIS/ IEC EMI/ EMC standards

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3.12.3 Reports

The software should generate reports, which can be viewed as well as printed as listed below:

i) A monthly report showing readings from every system. The reports shall highlight readings outside limits and systems, which did not call.

ii) A single page report yearly report for each remote monitoring. This shall be used to show the monthly readings for each site.

iii) Alarm Reports: This particular report shall give all information about the alarms, which occurred in any abnormal conditions.

iv) Report information shall be compatible with standard spread sheet programs.

v) All above reports of different type should be available in graphical presentation, on screen and printer.

vi) Scaling and calibration of analogue channel can be done by use of supplier Editor Software.

3.12.4 DATA BASE SECURITY

Database shall be in the form of SQL Server. The version of SQL shall be latest with proven track. Following security features shall be provided in the server software:

- Roles
- Fixed Server Roles
- Fixed Database Roles
- User-Defined Roles
- Application Roles
- Granting and Denying Permissions to Users and Roles

Over and above the above features, the software supplied by the vendor shall broadly have following essential features to access the database as applicable.

- Group Creation
- User Creation
- User Group Allocation
- Enable - Disable Account Status
- Audit Trail
- Access Level Based on the operation
- Roles and Reasons
- Password Masking

3.12.5 DESIGN REVIEW:

CP System sub-contractor should prepare detailed engineering package for central monitoring and control system along with schematic drawings and equipment/ materials list including make/ model

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of the same and get the same approved by EIL/ OWNER before procurement/execution.

3.12.6 INSPECTION

The prototype inspection along with simulation tests shall be done at specialist agency's office / workshop by EIL/ OWNER before the dispatch of the equipment and materials at site. For this purpose CP System sub-contractor should furnish notice to EIL/ OWNER minimum 15 days before the date of inspection.

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3.13 SPECIFICATION FOR SOIL RESISTIVITY TEST

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3.13.1 SCOPE

The scope of this standard is to conduct the following tests within a plant complex:

- Soil/sand resistivity up to 10m depth to be measured using Wenner's 4-pin method in offsite/ unit areas/ Vessel pit.

3.13.2 OBJECTIVE

The objective of the tests given by Para 1.0 is to assess the corrosiveness of the soil/ sand & to decide suitable locations for anode beds for CP System for prevention of external corrosion of structure/ equipment within a plant complex.

3.13.3 SOIL RESISTIVITY TEST

In general soil resistivity tests covered by this specification shall unless otherwise specified, be in line with the requirements of BS CP 1021. Wherever the requirements in this specification are in conflict with the above standard, the requirements under this specification shall be binding.

3.13.3.1 SOIL RESISTIVITY TEST BY WENNER 4-PIN METHOD

Soil resistivity by Wenner 4-Pin method to be conducted at 4 anode bed locations as per instructions of EIL, at each location soil resistivity readings to be taken for 2m, 4m, 6m &10m depth for distributed anode beds.

$$\rho = 2\pi AR$$

Where,

ρ	=	Soil resistivity in ohm-cm
A	=	Inter electrode spacing in cm
R	=	Resistance observed from soil resistivity meter in ohm.

While inserting electrodes in soil for taking soil resistivity care should be taken to make good contact of electrodes with the soil, for this purpose limited watering may be required at the electrode penetration points wherever soil is dry or less compact. The depth of penetration of electrodes should not exceed 1/10th of the electrode spacing.

3.13.3.2 CALIBRATION OF SOIL RESISTIVITY METER

Soil resistivity meter should be calibrated at a reputed laboratory before use. The calibration certificate must be furnished to ENGINEER-IN-CHARGE for approval of the meter before use of the same for soil resistivity test at site.

3.13.4.0 REPORT PREPARATION

All soil resistivity readings shall be typed and presented in a tabular form giving co-ordinates and other location reference of each test locations & depth of each reading. The soil resistivity is to be expressed in ohm-cm.

Six copies each of soil resistivity report to be furnished to OWNER/ EIL for record.

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4.0 MANDATORY SPARES FOR CATHODIC PROTECTION SYSTEM

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4.0 The Bidder shall supply the following spares for each T/R unit:

-	D.C. Voltmeter	Nos.	1
-	D.C. Ameter	Nos.	1
-	A.C. Voltmeter	Nos.	1
-	A.C. Ammeter	Nos.	1
-	Diodes	Nos.	2
-	SCR's	Nos.	2
-	D.C. Fuses for output side	Nos.	5
-	HRC fuse for Diodes	Nos.	5
-	A.C. fuses for input side	Nos.	5
-	D.C. Lightening arrestor	Nos.	2
-	A.C. Circuit breaker(MCB)	Nos.	2
-	Electronic Control Cards each type	Nos.	2
-	Filter circuit capacitor	Nos.	2
-	Signal light assembly for annunciation	Nos.	2
-	R.C. Surge Diverter	Nos.	2
-	Control transformer	Nos.	2
-	Coarse voltage control switch	Nos.	2
-	Coarse current control switch	Nos.	2
-	Fine voltage control switch	Nos.	2
-	Fine current control switch	Nos.	2
-	Auto Manual Mode selector switch	Nos.	2
-	Toggle switches	Nos.	2
-	Assorted Glass cartridge fuses	set.	15

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Annexure-1

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WELDING SPECIFICATION CHARTS FOR PIPING CLASSES

(SMMS DIVISION)

PROJECT : **EPCC TENDER FOR POLYPROPYLENE & BUTENE-1 UNIT OF BINA PETCHEM & REFINERY EXPANTION PROJECT (BPREP)**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED**

PMC : **ENGINEERS INDIA LIMITED**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
5	05-03-2026	REISSUED FOR TENDER	RITIK N.	UTTAM K.	PRABHAKAR
4	05-02-2026	REISSUED FOR TENDER	RITIK N.	UTTAM K.	PRABHAKAR
3	17.12.2025	REISSUED FOR TENDER	RITIK N.	UTTAM K.	PRABHAKAR
2	11.07.2025	A19A, B19AM A67A, B67AW, B4F, B50M, B78A added	U KUMAR	PRABHAKAR	R CHITARA
1	27.03.2025	WSC FOR D41A ADDED AND REISSUED FOR TENDER	U KUMAR	PRABHAKAR	R CHITARA

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Revision History:

Rev. No	Date	Purpose
A	8-11-2024	Issued for Tender
B	28-11-2024	A1K, A32A, A3K, A41A, A42A, A43A, A44A, A44K, A45A, A45K, A46A, A91A, A94A, A95A, A96A, A97A, B41A, B42A, B43A, B44A, B44K, B45A, B45K, B46A, B55A, D42A, J95A added
C	20-12-2024	Issued for Tender
0	13.03.2025	WSC FOR A11A, A41K, A9A, B20D, B4D, B72A, B72D, B92K, B9A, D23F, F22A, F2A, F92K, G22G, G2G PIPING CLASSES AND DISSIMILAR WELDING OF B72A TO B72D ADDED
1	27.03.2025	WSC FOR D41A ADDED AND REISSUED FOR TENDER
2	11.07.2025	A19A, B19AM A67A, B67AW, B4F, B50M, B78A added
3	17.12.2025	A11K, A11KI, A16A, A19AW, A1AI, AIF, A1N, A27M, A27N, A3F, A41F, A4F, A6A, A70M, A72F, A74M, A75A, A76A, A78A, A78AI, A79A, A7A, A88A, A92A, A98A, B11K, B4G, B51A, B51Q, B53AW, B59Q, B5A, B65D, B67A, B69AW, B6A, B70M, B72F, B74M, B77M, B78AI, B79A, B88A, D1F, D2D, D3F, D4F, D5A, D65A, D6A, D9A, F21K, F22AW, F27AW, F51Q, F52Q, F53M, F55AW,F55D, F55F, F56F, F57AW, F59AW, F59Q, F67AW, F88A, G51M, G53M, G55F, G59Q Added
4	05-02-2026	A21P, A40A, A60K, A61N, A61A, A62A, A69M, A71A, A83A, A92K, A99A, B21P, B21Q, B40A, B41K, B52A, B60K, B61A, B62A, B69M, B99A, B20Y, D23M, D40A, D41K, D52A, D69M, D20Q, F1A added
4	05-03-2026	F2G added

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GENERAL NOTES

1.1 Scope :
This document covers the Welding Specification for the piping classes covered in the Piping Material Specification (B957-6-44-0005-PMC01Rev. B dated 22.08.24, B957-6-44-0005-7401 REV.D Rev.0 dated 28.02.2025, B957-6-44-0005-PMC01 Rev.E dated 26.03.2025, B933-6-44-0005 Rev.A dated 19.9.2025, B957-6-44-0005 Rev. 0).WPS and PQR for the field fabrication and erection of piping system shall be made in conformity with this document. In case of any conflict between this document and Piping Material Specification for any piping class, the most stringent requirement shall be followed.

1.2 This document shall be read in conjunction with the latest revisions/editions of the following documents:

a) ASME Boiler and Pressure Vessel Codes

Section II Part C – Specification for Welding Rods, Electrodes, and Filler Metals
Section V – Nondestructive Examination
Section IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

b) ASME B31.3, Process Piping

c) ASTM E10, Standard Test Method for Brinell Hardness of Metallic Materials

d) Job Specification for Non Destructive Examination Requirements of Piping, B957-6-44-0016

e) Welding Specification for Fabrication of Piping, 6-77-0001 Rev.5. and B957-000-06-41-WSP-0001.

1.3 GTAW process can be applied in place of SMAW process with a corresponding suitable filler metal for the application.

1.4 Abbreviations:

GTAW : Gas Tungsten Arc Welding

PMS : Piping Material Specification

PQR : Procedure Qualification Record

SMAW : Shielded Metal Arc Welding

WSC : Welding Specification Chart

WPS : Welding Procedure Specification

1.5 ASME B31.3 PWHT thickness exemption for P no. 1 materials is not permitted for material thickness greater than 1.5 inch (38mm).

1.6 Additional CLG requirements (Doc no. RA-260816) given in the PMS shall be met.

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TECHNICAL NOTES:

1 **THE ROOT PASS FOR SINGLE SIDE WELDING SHALL BE DONE BY GTAW PROCESS**

2 **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

3 **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & ≤ 25 mm.**

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WSC FOR PIPING CLASSES: **A1AI, A2A, B2A, D2A, F2A**					
MATERIAL SPECIFICATIONS	PIPES	ASTM A106 GR. B, ASTM A672 GR. B60 CL.12 ASTM A 672 GR.B60 CL.22			
	FITTINGS	ASTM A 105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W			
	FLANGES	ASTM A 105			
	OTHERS	-			
BASE METAL `P' NO	**1**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **GTAW / SMAW (NOTE 1)**	FILLER PASS: **GTAW / SMAW (NOTE 1)**	ROOT PASS: **GTAW / SMAW (NOTE-1)**	FILLER PASS: **GTAW/ / SMAW (NOTE-1)**	
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **ER70S-2 / E6010**	FILLER PASS: **ER70S-2 / E7016/E7018**	ROOT PASS: **ER70S-2/ E6010**	FILLER PASS: **ER70S-2 / E7016/ E7018**	
	FILLET JOINT/SOCKET JOINT: **E7016/E7018/ER70S-2**				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	**ASME B31.3**				
GASES	PURGING: -		SHIELDING: **ARGON**		
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**		
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK >25 mm**		INTERPASS TEMP: ---: -		
POST HEATING: ---					
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **-**		HOLDING TIME**: -**		
	RATE OF HEATING: **-**		MIN. HOLDING TIME: **-**		
	METHOD OF COOLING: **-**		RATE OF COOLING: **-**		
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -	
	AT TEMPERATURE:		-		
	HARDNESS:				
CODE OF FABRICATION	**ASME B31.3& IBR**				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER. THE ROOT PASS FOR SINGLE SIDE WELDING SHALL BE DONE BY GTAW PROCESS.**

2. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>= 12.5MM & ≤ 25 MM.**

3. **PWHT SHALL BE DONE AS PER IBR FOR WALL THICKNESS EXCEEDING 20MM**

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WSC FOR PIPING CLASSES: **A3A, A91A, A92A, A94A, A95A, A96A, A97A, J2A, J95A**					
MATERIAL SPECIFICATIONS	PIPES	ASTM A 106 GR.B , IS-3589 GR.410, IS-1239			
	FITTINGS	ASTM A 105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W, IS-3589 GR.410, ASTM A 285 GR.C, IS-1239			
	FLANGES	ASTM A 105			
	OTHERS	-			
BASE METAL `P' NO	**1, Unassigned (IS-3589, IS-1239)**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **GTAW /SMAW**	FILLER PASS: **SMAW (NOTE-1)**	ROOT PASS **GTAW /SMAW**	FILLER PASS: **SMAW (NOTE-1)**	
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **ER70S-2/E6010**	FILLER PASS: **E6013/E7016/E7018**	ROOT PASS: **ER70S-2/ E6010**	FILLER PASS: **E6013/E7016/E7018**	
	FILLET JOINT/SOCKET JOINT: **E6013/ E7016/E7018/ ER70S-2**				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	**ASME B31.3**				
GASES	PURGING: -		SHIELDING: **ARGON**		
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**		
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/100°C FOR THK >25 mm**		INTERPASS TEMP.: ---		
POST HEATING: ---					
POST WELD HEAT TREATMENT	HOLDING TEMP: --		HOLDING TIME: **---**		
	RATE OF HEATING: **---**		MIN. HOLDING TIME: **---**		
	METHOD OF COOLING: **---**		RATE OF COOLING: **---**		
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -	
	AT TEMPERATURE:		-		
	HARDNESS:				
CODE OF FABRICATION	ASME B31.3				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK >=12.5 MM & <=25MM.**
3. **THREADED JOINTS FOR J2A & J95A PIPING CLASS SHALL BE MADE WITH 1" PTFE JOINING TAPE.**

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WSC FOR PIPING CLASSES: **A4A, A40A, A42A, A43A, A46A, B4A, B40A, B42A, B43A, B46A, D4A, D40A, D42A**				
MATERIAL SPECIFICATIONS	PIPES	ASTM A 333 GR.6, ASTM A 671 Gr CC60 CL. 32		
	FITTINGS	ASTM A 350 GR.LF2 CL.1, ASTM A 420 GR.WPL6, ASTM A 420 GR.WPL6-W		
	FLANGES	ASTM A 350 GR.LF2 CL.1		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW / SMAW (NOTE-2)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW / SMAW (NOTE-2)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **ER 80SNi 1 (NOTE-1)**	FILLER PASS: **ER 80SNi 1 /E7018-1 (NOTE-1)**	ROOT PASS: **ER80S-Ni1 (NOTE-1)**	FILLER PASS: **ER 80SNi 1 /E7018-1 (NOTE-1)**
	FILLET JOINT/SOCKET JOINT: **E7018 -1/: ER 80SNi 1 (NOTE-1)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-3)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK >25 mm**		INTERPASS TEMP.: **315°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: **-**		HOLDING TIME: **-**	
	RATE OF HEATING: **-**		MIN. HOLDING TIME: **-**	
	METHOD OF COOLING: **-**		RATE OF COOLING: **-**	
MECHANICAL PROPERTY REQUIREMENTS **(NOTE-4)**	CHARPY `V' NOTCH VALUE:		MIN: **20 J**	AVERAGE: **27 J**
	AT TEMPERATURE:		**-45 DEG C**	
	HARDNESS:			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **ALL BATCHES OF WELDING CONSUMABLES SHALL BE IMPACT TESTED AT - 45°C. FOR B4A PIPING CLASS, IMPACT TEST OF WELDING CONSUMABLES BATCH SHALL BE PERFORMED AT - 46°C.**

2. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMTER 2" AND SMALLER.**

3. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK >=12.7 MM & <= 25 MM.**

4. **DURING PQR, IMPACT TESTING SHALL BE CARRIED OUT AT – (MINUS) 45°C. FOR B4A PIPING CLASS, IMPACT TESTING SHALL BE CARRIED OUT AT – (MINUS) 46°C.**

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WSC FOR PIPING CLASSES: **B5A, D5A, B52A, D52A, F27AW, B51A, B53AW, B55A, D55A, F55AW, F57AW, F59AW**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A106 GR.B, ASTM A 672 GR.B60 CL.22**		
	FITTINGS	**ASTM A105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/ SMAW (NOTE-1)**	ROOT PASS: **GTAW**	FILLER PASS: **SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E**R70S-2**	FILLER PASS: **ER70S-2/ E7016 / E7018**	ROOT PASS: **ER70S-2**	FILLER PASS: **E7016 / E7018**
	FILLET JOINT/SOCKET JOINT: **E7016 / E7018**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK ≥25 mm**		INTERPASS TEMP.: ---	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **595 - 620°C**		HOLDING TIME: **1 HR / INCH THK**	
	RATE OF HEATING: **200°C / HR MAX**		MIN. HOLDING TIME: **1 HR**	
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C / HR MAX**	
MECHANICAL PROPERTY REQUIREMENTS **(NOTE-4)**	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX (NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & < 25 mm.**

3. **PWHT SHALL BE CARRIED OUT FOR WELD JOINTS FOR ANY ONE OR BOTH THE CONDITIONS GIVEN BELOW.**

   - **DESIGN TEMPERTURE OF LINE EXCEED 204 DEGREE CELSIUS.**
   - **WALL THICKNESS OF PIPE IS GREATER THAN 20MM IRRESPECTIVE OF DESIGN TEMPERATURE.**

   THE HARDNESS OF WELD AND HAZ SHALL NOT EXCEED 200 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.

4. **CHARPY V-NOTCH IMPACT TESTING OF WELD METAL SHALL BE CARIED OUT DURING WELDING PROCEDURE QUALIFICATION FOR THE PIPE WALL THICKNESS OVER 20 MM. IMPACT TESTING SHALL BE CARRIED OUT AT –(MINUS) 29°C.**

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WSC FOR PIPING CLASSES: **A61A, A62A, B61A, B62A, B78A, B79A, B88A, F88A, B69AW, F67AW, F22AW**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 106 GR.B, ASTMA 672 GR.B60 CL.22**		
	FITTINGS	**ASTM A 105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A 105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/ SMAW (NOTE-1)**	ROOT PASS: **GTAW**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/ GTAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **ER70S-2 (NOTE-2)**	FILLER PASS: **ER70S-2/ E7018-1/E7018 (NOTE-2)**	ROOT PASS: **ER70S-2 (NOTE-2)**	FILLER PASS: **ER70S-2/ E7018-1/E7018 (NOTE-2)**
	FILLET JOINT/SOCKET JOINT: **E7018-1 / E7018/ ER70S-2 (NOTE-2)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-3)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK >25 mm**		INTERPASS TEMP.: ---	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-4)**	HOLDING TEMP: **-**		HOLDING TIME: **-**	
	RATE OF HEATING: **-**		MIN. HOLDING TIME: **-**	
	METHOD OF COOLING: **-**		RATE OF COOLING: **-**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1 **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2 **EVERY BATCH OF ALL WELDING CONSUMABLES SHALL BE QUALIFIED FOR NACE SERVICE (NACE MR0103 and TM0284).**

3 **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK >=12.5 MM & <= 25MM.**

4 **ALL WELD JOINTS SHALL BE STRESS RELIEVED AND PWHT SHALL BE DONE AS PER LATEST EDITION OF ASME B31.3. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: **F22A**					
MATERIAL SPECIFICATIONS	PIPES	ASTM A106/ A 106M GR. B			
	FITTINGS	ASTM A234/A234M GR.WPB			
	FLANGES	ASTM A 105/ A 105M			
	OTHERS	-			
BASE METAL `P' NO	**1**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **GTAW / SMAW (NOTE 1)**	FILLER PASS: **GTAW / SMAW (NOTE 1)**	ROOT PASS: **GTAW / SMAW (NOTE-1)**	FILLER PASS: **GTAW/ / SMAW (NOTE-1)**	
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **ER70S-2 / E6010**	FILLER PASS: **ER70S-2 / E7016/E7018**	ROOT PASS: **ER70S-2/ E6010**	FILLER PASS: **ER70S-2 / E7016/ E7018**	
	FILLET JOINT/SOCKET JOINT: **E7016/E7018/ER70S-2**				
	BACKING RING: -		CONSUMABLE INSERT: -		
	ASME B31.3				
GASES	PURGING: -		SHIELDING: **ARGON**		
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**		
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK >25 mm**		INTERPASS TEMP: ---: -		
POST HEATING: ---					
	HOLDING TEMP: **-**		HOLDING TIME**: -**		
POST WELD HEAT TREATMENT **(NOTE-4)**	RATE OF HEATING: **-**		MIN. HOLDING TIME: **-**		
	METHOD OF COOLING: **-**		RATE OF COOLING: **-**		
MECHANICAL PROPERTY REQUIREMENTS (NOTE-3)	CHARPY `V' NOTCH VALUE:		MIN: **20J**	AVERAGE: **27J**	
	AT TEMPERATURE:		-		
	HARDNESS:				
CODE OF FABRICATION	**ASME B31.3& IBR**				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER. THE ROOT PASS FOR SINGLE SIDE WELDING SHALL BE DONE BY GTAW PROCESS.**

2. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>= 12.5MM & ≤ 25 MM.**

3. **CHARPY V-NOTCH IMPACT TESTING OF WELD METAL SHALL BE CARIED OUT DURING WELDING PROCEDURE QUALIFICATION FOR THE PIPE WALL THICKNESS OVER 12.7 MM. IMPACT TESTING SHALL BE CARRIED OUT AS PER ASME B31.3.**

4. **PWHT SHALL BE DONE AS PER IBR FOR WALL THICKNESS EXCEEDING 20MM.**

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WSC FOR PIPING CLASSES: **A11A**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A106 GR. B, ASTM A672 GR. B60 CL.12**		
	FITTINGS	**ASTM A 105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A 105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW/SMAW (NOTE-1,2)**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS:**GTAW/ SMAW (NOTE-1,2)**	FILLER PASS: **GTAW/SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **ER70S-2 / E6010**	FILLER PASS: **ER70S-2 / E7016/E7018**	ROOT PASS: **ER70S-2 / E6010**	FILLER PASS: **ER70S-2 / E7016/E7018**
	FILLET JOINT/SOCKET JOINT: **E7016/E7018/ER70S-2**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING:		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING:		SHIELDING: **99.995%**	
PREHEATING **(NOTE-3)**	PREHEAT TEMP: **10°C MIN./100°C (FOR THK>25MM)**		INTERPASS TEMP.: -	
POST HEATING:-				
POST WELD HEAT TREATMENT	HOLDING TEMP: **-**		HOLDING TIME: **-**	
	RATE OF HEATING: **-**		MIN. HOLDING TIME: **-**	
	METHOD OF COOLING: **-**		RATE OF COOLING: **-**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX. (NOTE-4)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1 **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2 **ROOT PASS FOR SINGLE SIDE WELDING SHALL BE DONE BY GTAW PROCESS.**

3 **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FORTHK>=12.5 MM & <= 25 MM.**

4 **HARDNESS SHALL BE RESTRICTED TO LESS THAN 200 BHN.**

5 **ALL WELD JOINTS SHALL BE STRESS RELIEVED AND PWHT SHALL BE DONE AS PER LATEST EDITION OF ASME B31.3. HARDNESS SHALL BE MEASURED AFTER PWHT**

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WSC FOR PIPING CLASSES: **A24A, B24A, B27A, B28A, D28A**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 106 GR.B, ASTM A 53 TYPE E GRADE B, ASTM A 672 GRADE C 70 CLASS 32**		
	FITTINGS	**ASTM A 105, ASTM A234 GR.WPB, ASTM A 234, GRADE WPB-W**		
	FLANGES	**ASTM A 105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLER PASS: **GTAW / SMAW (NOTE-2)**	ROOT PASS: **GTAW / SMAW (NOTE-1, 2,3)**	FILLER PASS: **GTAW / SMAW (NOTE- 2)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **ER70S-2**	FILLER PASS: **ER70S-2 / E7016 / E7018**	ROOT PASS: **ER70S-2 / E6010**	FILLER PASS: **ER70S-2 / E7016 / E7018**
	FILLET JOINT/SOCKET JOINT: **E7016 / E7018/ ER70S-2**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-3)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK >25 mm**		INTERPASS TEMP.: **----**	
POST HEATING: --				
POST WELD HEAT TREATMENT	HOLDING TEMP---		HOLDING TIME: **----**	
	RATE OF HEATING: **---**		MIN. HOLDING TIME: **---**	
	METHOD OF COOLING: **---**		RATE OF COOLING: **---**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS:			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1 **THE ROOT PASS FOR SINGLE SIDE WELDING SHALL BE DONE BY GTAW PROCESS**

2 **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

3 **FOR PIPING CLASS B27A & B28A, GTAW SHALL BE USED FOR THE ROOT PASS OF ALL WELDS.**

4 **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & ≤ 25 mm.**

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WSC FOR PIPING CLASSES: **A16A, A67A, A19AW, A67AW, A78A, B78A, A79A, A88A**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A106 GR.B, ASTM A 672 GR.B60 CL.22**		
	FITTINGS	**ASTM A105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A105**		
	OTHERS	**-**		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/ SMAW (NOTE-1)**	ROOT PASS: **GTAW**	FILLER PASS: **SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E**R70S-2**	FILLER PASS: **ER70S-2/ E7016 / E7018**	ROOT PASS: **ER70S-2**	FILLER PASS: **E7016 / E7018**
	FILLET JOINT/SOCKET JOINT: **E7016 / E7018**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK ≥25 mm**		INTERPASS TEMP.: ---	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **595 - 620°C**		HOLDING TIME: **1 HR / INCH THK**	
	RATE OF HEATING: **200°C / HR MAX**		MIN. HOLDING TIME: **1 HR**	
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C / HR MAX**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX (NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2. **ALL THE BATCHES OF WELDING CONSUMABLES SHALL BE NACE QUALIFIED (NACE MR0103 & NACE TM0284).**

3. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & < 25 mm.**

4. **PWHT SHALL BE CARRIED OUT FOR ALL PIPE WALL THICKNESS AND POST HEAT TREATED HARDNESS OF WELD SHALL NOT EXCEED 200 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.**

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WSC FOR PIPING CLASSES: **A78AI, B78AI**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A106 GR.B, ASTM A 672 GR.B60 CL.22**		
	FITTINGS	**ASTM A105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/ SMAW (NOTE-1)**	ROOT PASS: **GTAW**	FILLER PASS: **SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E**R70S-2**	FILLER PASS: **ER70S-2/ E7016 / E7018**	ROOT PASS: **ER70S-2**	FILLER PASS: **E7016 / E7018**
	FILLET JOINT/SOCKET JOINT: **E7016 / E7018**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK ≥25 mm**		INTERPASS TEMP.: ---	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **595 - 620°C**		HOLDING TIME: **1 HR / INCH THK**	
	RATE OF HEATING: **200°C / HR MAX**		MIN. HOLDING TIME: **1 HR**	
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C / HR MAX**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX (NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3& IBR**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**
2. **ALL THE BATCHES OF WELDING CONSUMABLES SHALL BE NACE QUALIFIED (NACE MR0103 & NACE TM0284).**
3. **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & < 25 mm.**
4. **PWHT SHALL BE CARRIED OUT FOR ALL PIPE WALL THICKNESS AND POST HEAT TREATED HARDNESS OF WELD SHALL NOT EXCEED 200 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.**

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WSC FOR PIPING CLASSES: A19A, B19A, A76A, A98A, F56A, A99A, B99A				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A106 GR.B, ASTM A 672 GR.B60 CL.22**		
	FITTINGS	**ASTM A105, ASTM A234 GR.WPB, ASTM A234 GR.WPB-W**		
	FLANGES	**ASTM A105**		
	OTHERS	-		
BASE METAL `P' NO	**1**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/ SMAW (NOTE-1)**	ROOT PASS: **GTAW**	FILLER PASS: **GTAW/SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **GTAW/SMAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E**R70S-2**	FILLER PASS: **ER70S-2/ E7016 / E7018**	ROOT PASS: **ER70S-2**	FILLER PASS: : **ER70S-2/ E7016 / E7018**
	FILLET JOINT/SOCKET JOINT: : **ER70S-2/E7016 / E7018**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: -		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995%**	
PREHEATING **(NOTE-2)**	PREHEAT TEMP: **10°C MIN/ 100°C FOR THK ≥25 mm**		INTERPASS TEMP.: ---	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **595 - 620°C**		HOLDING TIME: **1 HR / INCH THK**	
	RATE OF HEATING: **200°C / HR MAX**		MIN. HOLDING TIME: **1 HR**	
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C / HR MAX**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **200 BHN MAX (NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1 **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2 **PRE-HEAT TEMPERATURE OF ATLEAST 50°C SHALL BE PROVIDED FOR THE FIRST TWO PASSES FOR THK>=12.5 mm & < 25 mm.**

3 **PWHT SHALL BE CARRIED OUT FOR ALL PIPE WALL THICKNESS AND POST HEAT TREATED HARDNESS OF WELD SHALL NOT EXCEED 200 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING (EXCEPT A76A, A98A) SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.**

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WSC FOR PIPING CLASSES: B65D, F55D					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P11, ASTM A 691 GR.1.25CR CL.42**			
	FITTINGS	**ASTM A 182 GR.F11 CL.2, ASTM A234 GR.WP11 CL.1, ASTM A234 GR.WP11-W CL.1**			
	FLANGES	**ASTM A 182 GR.F11 CL.2**			
	OTHERS	-			
BASE METAL `P' NO	**4**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT			OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAWNOTE-1)		ROOTPASS: GTAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT			OTHER THAN BUTT	
	ROOT PASS: ER70S-B2L/ ER80S-B2 (NOTE-2)	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2 (NOTE-2)		ROOT PASS: ER70S-B2L/ ER80S-B2 (NOTE-2)	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L/ E8016-B2/ E8018-B2
	FILLET JOINT/SOCKET JOINT: E7016-B2L/ E7018-B2L /ER70S-B2L/E8016-B2/E8018-B2 (NOTE-2)				
	BACKING RING: -			CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3				
GASES	PURGING: -			SHIELDING: ARGON	
GAS COMPOSITION	PURGING: -			SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 150°C MIN.			INTERPASS TEMP.: 250°C MAX.	
POST HEATING: ---					
POST WELD HEAT TREATMENT (NOTE-2)	HOLDING TEMP: -			HOLDING TIME: -	
	RATE OF HEATING: -			MIN. HOLDING TIME: -	
	METHOD OF COOLING: -			RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE: (NOTE-3)			MIN: 20J	AVERAGE: 27J
	AT TEMPERATURE:			-	
	HARDNESS: 225 BHN MAX. (NOTE-2)				
CODE OF FABRICATION	ASME B31.3				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **PWHT SHALL BE DONE AS PER LATEST ASME B31.3 FOR ALL WALL THICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**
3. **CHARPY V-NOTCH IMPACT TESTING OF WELD METAL SHALL BE CARRIED OUT DURING WELDING PROCEDURE QUALIFICATION FOR THE PIPE WALL THICKNESS OVER 20 MM. IMPACT TESTING SHALL BE CARRIED OUT AT 0°C.**

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WSC FOR PIPING CLASSES: **B4D, B72D**					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P11, ASTM A 691 GR.1.25CR CL.42**			
	FITTINGS	**ASTM A 182 GR.F11 CL.2, ASTM A234 GR.WP11 CL.1, ASTM A234 GR.WP11-W CL.1**			
	FLANGES	**ASTM A 182 GR.F11 CL.2**			
	OTHERS	-			
BASE METAL `P' NO	**4**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW	FILLER PASS: GTAW/ SMAW (NOTE-1)	
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: ER70S-B2L/ ER80S-B2	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2	ROOT PASS: ER70S-B2L/ ER80S-B2	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L/ E8016-B2/ E8018-B2	
	FILLET JOINT/SOCKET JOINT: E7016-B2L/ E7018-B2L /ER70S-B2L/E8016-B2/E8018-B2				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	ASME B31.3				
GASES	**PURGING: -**		SHIELDING: ARGON		
GAS COMPOSITION	PURGING: -		SHIELDING: **99.995** %		
PREHEATING	PREHEAT TEMP: 150°C MIN.		INTERPASS TEMP.: 250°C MAX.		
POST HEATING: ---					
POST WELD HEAT TREATMENT (NOTE-2)	HOLDING TEMP: -		HOLDING TIME: -		
	RATE OF HEATING: -		MIN. HOLDING TIME: -		
	METHOD OF COOLING: -		RATE OF COOLING: -		
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -	
	AT TEMPERATURE:		-		
	HARDNESS: 225 BHN MAX. (NOTE-2)				
CODE OF FABRICATION	ASME B31.3				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2. **PWHT SHALL BE DONE AS PER LATEST ASME B31.3 FOR ALL WALL THICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: **B20D**					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P11, ASTM A 691 GR.1.25CR CL.42**			
	FITTINGS	**ASTM A 182 GR.F11 CL.2, ASTM A234 GR.WP11 CL.1, ASTM A234 GR.WP11-W CL.1**			
	FLANGES	**ASTM A 182 GR.F11 CL.2**			
	OTHERS	-			
BASE METAL `P' NO	**4**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT			OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)		ROOTPASS: GTAW	FILLER PASS: GTAW/ SMAW (NOTE-1)
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT			OTHER THAN BUTT	
	ROOT PASS: ER70S-B2L/ ER80S-B2	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2		ROOT PASS: ER70S-B2L/ ER80S-B2	FILLER PASS: ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L/ E8016-B2/ E8018-B2
	FILLET JOINT/SOCKET JOINT: E7016-B2L/ E7018-B2L /ER70S-B2L/E8016-B2/E8018-B2				
	BACKING RING: -			CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3				
GASES	**PURGING: -**			SHIELDING: ARGON	
GAS COMPOSITION	PURGING: **-**			SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 150°C MIN.			INTERPASS TEMP.: 250°C MAX.	
POST HEATING: ---					
POST WELD HEAT TREATMENT (NOTE-2)	HOLDING TEMP: -			HOLDING TIME: -	
	RATE OF HEATING: -			MIN. HOLDING TIME: -	
	METHOD OF COOLING: -			RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:			MIN: -	AVERAGE: -
	AT TEMPERATURE:			-	
	HARDNESS: 225 BHN MAX. (NOTE-2)				
CODE OF FABRICATION	ASME B31.3 & IBR				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2. **PWHT SHALL BE DONE AS PER LATEST EDITION OF IBR. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: A1F, A3F, B72F, A4F, D1F, D3F, D4F, B4F, D41F, A41F, A72F

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P5, ASTM A 691 GR.5CR CL.42**		
	FITTINGS	**ASTM A 182 GR.F5 , ASTM A 234 GR.WP5 CL.1, ASTM A 234 GR.WP5-W CL.1**		
	FLANGES	**ASTM A 182 GR.F5**		
	OTHERS	-		
BASE METAL `P' NO	**5B**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E**R80S-B6**	FILLER PASS: **ER80S-B6 / E8016-B6L/ E8018-B6L**	ROOT PASS:**ER80S-B6**	FILLER PASS: **ER80S-B6 / E8016-B6L/E8018-B6L**
	FILLET JOINT/SOCKET JOINT: **E8016-B6L/E8018-B6L**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **99.995%**		SHIELDING: **99.995%**	
PREHEATING	PREHEAT TEMP: **180°C MIN**		INTERPASS TEMP.: **250-300°C**	
POST HEATING: **(NOTE 2)**				
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **705-760°C**		HOLDING TIME: **1HOUR PER INCH THK**	
	RATE OF HEATING: **200°C/HR MAX**		MIN. HOLDING TIME: **2 HRS**	
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C/HR MAX**	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **241 BHN MAX (NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2 **POST HEATING IS REQUIED IF THE WELDMETAL IS ALLOWED TO COOL DOWN BELOW 150 °C AFTER COMPLETION OF WELDING AND BEFORE PWHT IS CARRIED OUT. POST HEATING INVOLVES HEATING TO 300 °C AND MAINTAINING FOR AN HOUR MINIMUM, THEN WRAPPED WITH MINERAL WOOL BEFORE ALLOWING IT TO COOL TO ROOM TEMPERATURE.**

3 **PWHT SHALL BE DONE FOR ALL WALL THICKNESSES AND POST HEAT TRATED HARDNESS OF WELD SHALL NOT EXCEED 241 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.**

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WSC FOR PIPING CLASSES: F55F, G55F					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P5, ASTM A 691 GR.5CR CL.42**			
	FITTINGS	**ASTM A 182 GR.F5 , ASTM A 234 GR.WP5 CL.1, ASTM A 234 GR.WP5-W CL.1**			
	FLANGES	**ASTM A 182 GR.F5**			
	OTHERS	-			
BASE METAL `P' NO	**5B**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW**	
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: E**R80S-B6**	FILLER PASS: **ER80S-B6 / E8016-B6L/ E8018-B6L**	ROOT PASS:**ER80S-B6**	FILLER PASS: **ER80S-B6 / E8016-B6L/E8018-B6L**	
	FILLET JOINT/SOCKET JOINT: **E8016-B6L/E8018-B6L**				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	**ASME B31.3**				
GASES	PURGING: **ARGON**		SHIELDING: **ARGON**		
GAS COMPOSITION	PURGING: **99.995%**		SHIELDING: **99.995%**		
PREHEATING	PREHEAT TEMP: **180°C MIN**		INTERPASS TEMP.: **250-300°C**		
POST HEATING: **(NOTE 2)**					
POST WELD HEAT TREATMENT **(NOTE-3)**	HOLDING TEMP: **705-760°C**		HOLDING TIME: **1HOUR PER INCH THK**		
	RATE OF HEATING: **200°C/HR MAX**		MIN. HOLDING TIME: **2 HRS**		
	METHOD OF COOLING: **CONTROLLED**		RATE OF COOLING: **200°C/HR MAX**		
MECHANICAL PROPERTY REQUIREMENTS **(NOTE-4)**	CHARPY `V' NOTCH VALUE:		MIN: **20J**	AVERAGE: **27J**	
	AT TEMPERATURE:		-		
	HARDNESS: **225 BHN MAX (NOTE-3)**				
CODE OF FABRICATION	**ASME B31.3**				

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2. **POST HEATING IS REQUIED IF THE WELDMETAL IS ALLOWED TO COOL DOWN BELOW 150 °C AFTER COMPLETION OF WELDING AND BEFORE PWHT IS CARRIED OUT. POST HEATING INVOLVES HEATING TO 300 °C AND MAINTAINING FOR AN HOUR MINIMUM, THEN WRAPPED WITH MINERAL WOOL BEFORE ALLOWING IT TO COOL TO ROOM TEMPERATURE.**

3. **PWHT SHALL BE DONE FOR ALL WALL THICKNESSES AND POST HEAT TRATED HARDNESS OF WELD SHALL NOT EXCEED 225 BHN. ANY KIND OF ATTACHMENTS ON SUCH PIPING SHALL BE STRESS RELIEVED AND SHALL ALSO MEET THE HARDNESS LIMIT.**

4. **CHARPY V-NOTCH IMPACT TESTING OF WELD METAL SHALL BE CARRIED OUT DURING WELDING PROCEDURE QUALIFICATION FOR THE PIPE WALL THICKNESS OVER 20 MM. IMPACT TESTING SHALL BE CARRIED OUT AT 0°C**

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WSC FOR PIPING CLASSES: **D23F**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P5, ASTM A 691 GR 5CR CL.42**		
	FITTINGS	**ASTM A 182 GR.F5, ASTM A 234 GR.WP5 CL. 1, ASTM A 234 GR.WP5-W CL.1**		
	FLANGES	**ASTM A 182 GR.F5**		
	OTHERS	-		
BASE METAL `P' NO	**5B**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW	FILLER PASS: GTAW/ SMAW (NOTE-1)
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER80S- B6	FILLER PASS: ER80S-B6/ E8016-B6L/ E8018-B6L/ E8016-B6/ E8018-B6	ROOT PASS: ER80S- B6	FILLER PASS: ER80S-B6/ E8016-B6L/ E8018-B6L/ E8016-B6/ E8018-B6
	FILLET JOINT/SOCKET JOINT: E8016-B6L/ E8018-B6L/ E8016-B6/ E8018-B6/ ER80S-B6/			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	**PURGING: ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: **99.995%**		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 200°C MIN.		INTER PASS TEMP.: 300°C MAX	
POST HEATING: 300°C MIN. FOR 60 MINUTES FOLLOWED BY SUITALBE INSULATION COVER BEFROE PWHT				
POST WELD HEAT TREATMENT (NOTE-2)	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: 241 BHN MAX. (NOTE-2)			
CODE OF FABRICATION	ASME 31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2. **PWHT SHALL BE DONE AS PER LATEST EDITION OF ASME B31.3 FOR ALL WALL THICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: B4G				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P9, ASTM A 691 GR.9CR CL.42**		
	FITTINGS	**ASTM A 182 GR.F9, ASTM A 234 GR.WP9 CL. 1, ASTM A 234 GR.WP9-W CL. 1**		
	FLANGES	**ASTM A 182 GR.F9, ASTM A 105**		
	OTHERS	**-**		
BASE METAL `P' NO	**5B**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER80S-B8 (NOTE-1)	FILLER PASS: ER80S-B8/ E8016-B8L/ E8018-B8L / E8016-B8/ E8018-B8 (NOTE-1)	ROOT PASS: ER80S-B8 (NOTE-1)	FILLER PASS: ER80S-B8/ E8016-B8L/E8018-B8L / E8016-B8/ E8018-B8 (NOTE-1)
	FILLET JOINT/SOCKET JOINT: E8016-B8L/E8018-B8L/ E8016-B8/ E8018-B8/ ER80S-B8			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: **- ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - **99.995** %		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 250°C MIN.		INTERPASS TEMP.: 300°C MAX.	
POST HEATING: 300°C MIN. FOR 30 MINUTES FOLLOWED BY SUITALBE INSULATION COVER BEFROE PWHT				
POST WELD HEAT TREATMENT (NOTE-2)	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: 241 BHN MAX. (NOTE-2)			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2. **PWHT SHALL BE DONE AS PER LATEST EDITION OF ASME B31.3 FOR ALL WALLTHICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: F2G, G2G, G22G

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335/ A335M GR.P91, ASTM A 691 GR.P91 CL.42**					
	FITTINGS	**ASTM A 234 GR.WP91, ASTM A 234 GR.WP91-W**					
	FLANGES	**ASTM A 182 GR.F91**					
	OTHERS	-					
BASE METAL 'P' NO	**15E**						
WELDING PROCESS	GROOVE JOINTS						
	BUTT			OTHER THAN BUTT			
	ROOT PASS **GTAW**	FILLER PASS **GTAW/ SMAW (NOTE-1)**		ROOT PASS **GTAW**	FILLER PASS **GTAW/ SMAW (NOTE-1)**		
	FILLET JOINTS / SOCKET JOINTS	**SMAW/GTAW**					
WELDING MATERIALS	GROOVE JOINTS						
	BUTT			OTHER THAN BUTT			
	ROOT PASS ER90S-B91 (NOTE-2,3,4)	**FILLER PASS ER90S-B91 / E9015-B91/ E9018-B91 (NOTE-2,3,4)**		**ROOT PASS ER90S-B91 (NOTE-2,3,4)**	**FILLER PASS ER90S-B91 / E9015-B91/ E9018-B91 (NOTE-2,3,4)**		
	FILLET JOINTS / SOCKET JOINTS	**E9015-B91/E9018-B91/ER90S-B91 (NOTE-2,3,4)**					
	BACKING RING	-		CONSUMABLE INSERT	-		
JOINT PREPN.	**ASME B31.3**						
GASES	PURGING	**ARGON**		SHIELDING	**ARGON**		
GAS COMPOSITION	PURGING	**99.995%**		SHIELDING	**99.995%**		
PREHEATING	PREHEAT TEMP	**250°C MIN.**		POST HEATING	**350°C MIN. FOR 1 HOUR FOLLOWED BY SUITALBE INSULATION COVER AND COOLED DOWN TO 93°C MINIMUM BEFORE PWHT**		
CONTINUITY OF WELDING AND INTERPASS	**250-300°C**						
POST WELD HEAT TREATMENT **(NOTE-5)**	HOLDING TEMP	-		HOLDING TIME	-		
	RATE OF HEATING	-		MIN HOLDING TIME	-		
	METHOD OF COOLING	-		RATE OF COOLING	-		
MECH. PROPERTY REQUIREMENTS CHARPY 'V' NOTCH IMPACT TEST VALUE **(NOTE-4)**				MIN	**21J**	AVERAGE	**27J**
	AT TEMPERATURE	-					
	HARDNESS-	**196-270 BHN (NOTE-5)**					
CODE OF FABRICATION	**ASME B31.3 & IBR**						

TECHNICAL NOTES :

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **FILLER METAL AND WELD DEPOSIT SHALL HAVE DIFFUSIBLE HYDROGEN CONTENT TYPICALLY BELOW 4ML/100G.**
3. **NICKEL PLUS MANGANESE CONTENT OF FILLER METAL SHALL NOT BE GREATER THAN 1.2%.**
4. **DURING EQT, IMPACT TESTING SHALL BE CARRIED OUT AT 20°C.**
5. **PWHT SHALL BE DONE AS PER LATEST IBR FOR ALL WALL THICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: **A92K, B92K, F92K**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP304, ASTM A 358 TP304 CL.1**		
	FITTINGS	**ASTM A 182 GR.F304, ASTM A 403 GR.WP304-S, ASTM A 403 GR.WP304-WX**		
	FLANGES	**ASTM A 182 GR.F304**		
	OTHERS	-		
BASE METAL `P' NO	**8**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW/SMAW (NOTE-1)	FILLER PASS: GTAW/ SMAW (NOTE-1)
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308/ER308L	FILLER PASS: ER308/ ER308L/ E308-15/16/ E308L-15/16	ROOT PASS: ER308/ ER308L/ E308-15/16/ E308L-15/16	FILLER PASS: ER308/ ER308L/ E308-15/16/ E308L-15/16
	FILLET JOINT/SOCKET JOINT: E308-15/16/ E308L-15/16 /ER308 / ER 308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	**PURGING: - ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: **- 99.995** %		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A11K, B11K, F21K**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP304L, ASTM A 358 TP304L CL.1**		
	FITTINGS	**ASTM A 182 GR.F304L, ASTM A 403 GR.WP304L-S, ASTM A 403 GR.WP304L-WX**		
	FLANGES	**ASTM A 182 GR.F304L**		
	OTHERS	-		
BASE METAL `P' NO	**8**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW/SMAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308L (NOTE-1)	FILLER PASS: ER308L / E308L-15/16 (NOTE-1)	ROOT PASS: ER308L / E308L-15/16 (NOTE-1)	FILLER PASS : ER308L/ E308L-15/16 (NOTE-1)
	FILLET JOINT/SOCKET JOINT: E308L-15/16 /ER308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: **- ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - **99.995** %		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A11KI**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP304L, ASTM A 358 TP304L CL.1**		
	FITTINGS	**ASTM A 182 GR.F304L, ASTM A 403 GR.WP304L-S, ASTM A 403 GR.WP304L-WX**		
	FLANGES	**ASTM A 182 GR.F304L**		
	OTHERS	-		
BASE METAL `P' NO	**8**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW/SMAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308L (NOTE-1)	FILLER PASS: ER308L / E308L-15/16 (NOTE-1)	ROOT PASS: ER308L / E308L-15/16 (NOTE-1)	FILLER PASS : ER308L/ E308L-15/16 (NOTE-1)
	FILLET JOINT/SOCKET JOINT: E308L-15/16 /ER308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: **- ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - **99.995** %		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3 & IBR			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A60K, B60K**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP304L, ASTM A 358 TP304L CL.1**		
	FITTINGS	**ASTM A 182 GR.F304L, ASTM A 403 GR.WP304L-S, ASTM A 403 GR.WP304L-WX**		
	FLANGES	**ASTM A 182 GR.F304L**		
	OTHERS	-		
BASE METAL `P' NO	**8**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW/SMAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308L (NOTE-1)	FILLER PASS: ER308L / E308L-15/16 (NOTE-1)	ROOT PASS: ER308L / E308L-15/16 (NOTE-1)	FILLER PASS : ER308L/ E308L-15/16 (NOTE-1)
	FILLET JOINT/SOCKET JOINT: E308L-15/16 /ER308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: **- ARGON**		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - **99.995** %		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A20K, A21K, A23K, A24K, A28K, B20K, D20K, D21K,**				
MATERIAL SPECIFICATIONS	PIPES	ASTM A 312 TP304/304L, ASTM A 358 TP304/304L CL.2		
	FITTINGS	ASTM A 182 DUAL GRADE F304 / 304L, ASTM A 403 GR.WP304/304L-S, ASTM A403 GR.WP304/304LWX		
	FLANGES	ASTM A 182 GR.F304/304L		
	OTHERS	-		
BASE METAL `P' NO	8			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW/SMAW (NOTE-1)	FILLER PASS: GTAW/ SMAW (NOTE-1)
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308L	FILLER PASS: : ER308L / E308L-15/16	ROOT PASS: ER308L / E308L-15/16	FILLER PASS : ER308L/ E308L-15/16
	FILLET JOINT/SOCKET JOINT: E308L-15/16 /ER308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: - ARGON		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - 99.995 %		SHIELDING: 99.995 %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.

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WSC FOR PIPING CLASSES: **A42K, B42K, B46K, D42K, D54K, F55K**				
MATERIAL SPECIFICATIONS	PIPES	ASTM A 312 TP304/304L		
	FITTINGS	ASTM A 182 GR.F304/304L, ASTM A 403 GR.WP304/304L-S, ASTM A 403 DUAL GRADE WP-WX 304 / 304L		
	FLANGES	ASTM A 182 GR.F304/304L		
	OTHERS	-		
BASE METAL `P' NO	8			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW/SMAW (NOTE-1,2)	FILLER PASS: GTAW/ SMAW (NOTE-1)
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308L (NOTE-2,3)	FILLER PASS:ER308L / E308L-15/16 (NOTE-2,3)	ROOT PASS: ER308L / E308L-15/16 (NOTE-2,3)	FILLER PASS : ER308L/ E308L-15/16 (NOTE-2,3)
	FILLET JOINT/SOCKET JOINT: E308L-15/16 /ER308L (NOTE-2,3)			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: - ARGON		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - 99.995 %		SHIELDING: 99.995 %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: 0.38MM	AVERAGE: 0.38MM
	AT TEMPERATURE:		MINUS (-) 196°C	
	HARDNESS:			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.
2. FOR PIPING CLASS B46K, GTAW SHALL BE USED FOR THE ROOT PASS OF ALL WELDS.
3. ALL THE BATCHES OF FILLER MATERIALS SHALL HAVE GUARANTEED MINIMUM AS WELDED IMPACT VALUE OF 0.38 MM LATERAL EXPANSION AT MINUS (-) 196°C AT SITE. ALL THE FIVE VALUES SHALL BE OVER 0.38 MM.
4. FERRITE NUMBER IN THE WELDING CONSUMABLES SHALL BE GREATER THAN 1.

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WSC FOR PIPING CLASSES: **A1N, A27N**					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP316L, ASTM A 358 TP316L CL.1**			
	FITTINGS	**ASTM A 182 GR.F316L, ASTM A 403 GR.WP316L-S, ASTM A 403 GR.WP316L-WX**			
	FLANGES	**ASTM A 182 GR.F316L**			
	OTHERS	-			
BASE METAL `P' NO	**8**				
WELDING PROCESS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW/SMAW (NOTE-1)	FILLER PASS: GTAW/ SMAW (NOTE-1)	
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW				
WELDING MATERIALS	GROOVE JOINTS				
	BUTT		OTHER THAN BUTT		
	ROOT PASS: ER316L	FILLER PASS: ER316L/ E316L-15/16	ROOT PASS: ER316L/ E316L-15/16	FILLER PASS : ER316L/ E316L-15/16	
	FILLET JOINT/SOCKET JOINT: E316L-15/16/ER316L				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	ASME B31.3				
GASES	PURGING: **- ARGON**		SHIELDING: ARGON		
GAS COMPOSITION	PURGING: - **99.995** %		SHIELDING: **99.995** %		
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.		
POST HEATING: -					
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -		
	RATE OF HEATING: -		MIN. HOLDING TIME: -		
	METHOD OF COOLING: -		RATE OF COOLING: -		
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:	
	AT TEMPERATURE:		-		
	HARDNESS: -				
CODE OF FABRICATION	ASME B31.3				

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A60N**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP316L, ASTM A 358 TP316L CL.1**		
	FITTINGS	**ASTM A 182 GR.F316L, ASTM A 403 GR.WP316L-S, ASTM A 403 GR.WP316L-WX**		
	FLANGES	**ASTM A 182 GR.F316L**		
	OTHERS	**-**		
BASE METAL `P' NO	**8**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW/SMAW (NOTE-1)**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER316L**	FILLER PASS: **ER316L/ E316L-15/16**	ROOT PASS: **ER316L/ E316L-15/16**	FILLER PASS : **ER316L/ E316L-15/16**
	FILLET JOINT/SOCKET JOINT: **E316L-15/16/ER316L**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: - **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **10 °C**		INTERPASS TEMP.: **175°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A28M, A69M, B69M, D69M**

MATERIAL SPECIFICATIONS	PIPES	ASTM A 312 TP316/316L DUAL		
	FITTINGS	ASTM A 182 GR.F316/316L DUAL, ASTM A403GR.WP316/316L-WX DUAL		
	FLANGES	ASTM A 182 GR.F316/316L DUAL		
	OTHERS	-		
BASE METAL `P' NO	8			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW/SMAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER316L(NOTE-1)	FILLER PASS: : ER316L/ E316L-15/16(NOTE-1)	ROOT PASS: ER316L/ E316L-15/16(NOTE-1)	FILLER PASS : ER316L/ E316L-15/16(NOTE-1)
	FILLET JOINT/SOCKET JOINT: ER316L/ E316L-15/16 (NOTE-1)			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: - ARGON		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - 99.995 %		SHIELDING: 99.995 %	
PREHEATING	PREHEAT TEMP: 10 °C MIN.		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A1K, A3K, A44K, A45K, B44K, B45K**				
MATERIAL SPECIFICATIONS	PIPES	ASTM A 312 TP304, ASTM A 358 TP304 CL.1		
	FITTINGS	ASTM A 182 GR.F304, ASTM A 403 GR.WP304-S, ASTM A 403 GR.WP304-WX		
	FLANGES	ASTM A 182 GR.F304		
	OTHERS	-		
BASE METAL `P' NO	8			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW	ROOTPASS: GTAW/SMAW	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER308/ ER308L	FILLER PASS: ER308 ER308L/ E308-15/16/ E308L-15/16 (NOTE-1)	ROOT PASS: ER308/ ER308L/ E308-15/16/ E308L-15/16 (NOTE-1)	FILLER PASS: ER308 ER308L/ E308-15/16 E308L-15/16 (NOTE-1)
	FILLET JOINT/SOCKET JOINT: E308-15/16/ E308L-15/16 /ER308 / ER 308L			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: - ARGON		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - 99.995 %		SHIELDING: 99.995 %	
PREHEATING	PREHEAT TEMP: 10 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

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WSC FOR PIPING CLASSES: **A41K, B41K, D41K**

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP304, ASTM A 358 TP304 CL.1**
	FITTINGS	**ASTM A 182 GR.F304, ASTM A 403 GR.WP304-S, ASTM A 403 GR.WP304-WX**
	FLANGES	**ASTM A 182 GR.F304**
	OTHERS	**-**

BASE METAL `P' NO	**8**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW/SMAW**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER308/ER308L (NOTE-2,3)**	FILLER PASS: **ER308/ ER308L/ E308-15/16/ E308L-15/16 (NOTE-2,3)**	ROOT PASS: **ER308/ ER308L/ E308-15/16/ E308L-15/16 (NOTE-2,3)**	FILLER PASS: **ER308/ ER308L/ E308-15/16/ E308L-15/16 (NOTE-2,3)**
	FILLET JOINT/SOCKET JOINT: **E308-15/16/ E308L-15/16 /ER308 / ER 308L (NOTE-2,3)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING**: - ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **- 99.995** %		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **10 °C**		INTERPASS TEMP.: **175°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: 0.38MM	AVERAGE: **0.38MM**
	AT TEMPERATURE: **MINUS (-) 196°C**		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **EACH BATCH OF WELDING CONSUMABLES SHALL MEET LATERAL EXPANSION VALUE OF 0.38MM MINIMUM AT (-196°C).**
3. **FERRITE NUMBER IN THE WELDING CONSUMABLES SHALL BE GREATER THAN 1.**

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WSC FOR PIPING CLASSES: **A70M, B70M, B50M, F53M, G51M, G53M**					
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 312 TP321, ASTM A 358 TP321 CL.1**			
	FITTINGS	**ASTM A 182 GR.F321, ASTM A 403 GR.WP321-S, ASTM A 403 GR.WP321-WX**			
	FLANGES	**ASTM A 182 GR.F321**			
	OTHERS	**-**			
BASE METAL `P' NO	**8**				
WELDING PROCESS	**GROOVE JOINTS**				
	BUTT		**OTHER THAN BUTT**		
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW**	
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**				
WELDING MATERIALS	**GROOVE JOINTS**				
	BUTT		**OTHER THAN BUTT**		
	ROOT PASS: **ER321/ER347**	FILLER PASS: **ER321/ER347 / E347-15/16**	ROOT PASS: **ER321/ER347**	FILLER PASS: **ER321/ ER347 / E347-15/16**	
	FILLET JOINT/SOCKET JOINT: **E347-15/16**				
	BACKING RING: -		CONSUMABLE INSERT: -		
JOINT PREPARATION	**ASME B31.3**				
GASES	PURGING: **ARGON**		SHIELDING: **ARGON**		
GAS COMPOSITION	PURGING: **99.995%**		SHIELDING: **99.995 %**		
PREHEATING	PREHEAT TEMP: **10°C**		INTERPASS TEMP.: **175°C MAX**		
POST HEATING: ---					
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -		
	RATE OF HEATING: -		MIN. HOLDING TIME: -		
	METHOD OF COOLING: -		RATE OF COOLING: -		
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -	
	AT TEMPERATURE:		-		
	HARDNESS: -				
CODE OF FABRICATION	**ASME B31.3**				

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

2. **FERRITE NUBMBER OF THE WELD DEPOSIT SHALL BE CHECKED DURING PROCEDURE QUAILFICATION AND SHALL BE IN THE RANGE OF 3-8 %. FERRITE SCOPE SHALL BE USED FOR MEASURING FERRITE LEVELS.**

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WSC FOR PIPING CLASSES: D2D				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 335 GR.P11, ASTM A 691 GR.1.25CR CL.42**		
	FITTINGS	**ASTM A 182 GR.F11 CL.2, ASTM A234 GR.WP11 CL.1**		
	FLANGES	**ASTM A 182 GR.F11 CL.2**		
	OTHERS	**-**		
BASE METAL `P' NO	**4**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER70S-B2L/ ER80S-B2**	FILLER PASS: **ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2**	ROOT PASS: **ER70S-B2L/ ER80S-B2**	FILLER PASS: **ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L/ E8016-B2/ E8018-B2**
	FILLET JOINT/SOCKET JOINT: **E7016-B2L/ E7018-B2L /ER70S-B2L/E8016-B2/E8018-B2**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **-**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **-**		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: **150°C MIN.**		INTERPASS TEMP.: **250°C MAX.**	
POST HEATING: ---				
POST WELD HEAT TREATMENT **(NOTE-2)**	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:		-	
	HARDNESS: **225 BHN MAX. (NOTE-2)**			
CODE OF FABRICATION	**ASME B31.3 & IBR**			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **PWHT SHALL BE DONE AS PER LATEST IBR FOR ALL WALL THICKNESSES. HARDNESS SHALL BE MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: **B72A TO B72D**				
MATERIAL SPECIFICATIONS	PIPES			
	FITTINGS	---		
	FLANGES			
	OTHERS	---		
BASE METAL `P' NO	**1 TO 4**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER70S-B2L/ ER80S-B2**	FILLER PASS: **ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2**	ROOT PASS: **ER70S-B2L/ ER80S-B2**	FILLER PASS : **ER70S-B2L/ ER80S-B2/ E7016-B2L/ E7018-B2L//E8016-B2/ E8018-B2**
	FILLET JOINT/SOCKET JOINT: **E7016-B2L/ E7018-B2L /ER70S-B2L/E8016-B2/E8018-B2**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **99.995%**		SHIELDING: **99.995%**	
PREHEATING	PREHEAT TEMP: **150ºC**		INTERPASS TEMP.: **250ºC Max.**	
POST HEATING: -				
POST WELD HEAT TREATMENT **(NOTE-2)**	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE: --
	AT TEMPERATURE:		-	
	HARDNESS: **(NOTE-3)**			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **PWHT SHALL BE DONE AS PER LATEST ASME B31.3 FOR ALL WALL THICKNESSES. THE PWHT TEMPERATURE SHALL BE OF P11 MATERIAL.**
3. **HARDNESS SHALL BE MEASURED AFTER PWHT. HARDNESS OF WELD AND P11 HAZ SIDE SHALL BE 225 BHN MAX AND FOR CS HAZ HARDNESS SHALL BE 200BHN MAX.**

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WSC FOR PIPING CLASSES: A27M, A74M, D23M				
MATERIAL SPECIFICATIONS	PIPES	ASTM A 312 TP321, ASTM A 358 TP 321 CL.1		
	FITTINGS	ASTM A 182 GR.F321, ASTM A 403 GR.WP321-S, ASTM A403 GR.WP 321-WX		
	FLANGES	ASTM A 182 GR.F321		
	OTHERS	-		
BASE METAL `P' NO	8			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: GTAW	FILLERPASS: GTAW/SMAW (NOTE-1)	ROOTPASS: GTAW/SMAW (NOTE-1)	FILLER PASS: GTAW/ SMAW
	FILLET JOINTS/ SOCKET JOINTS: SMAW/GTAW			
WELDING MATERIALS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: ER347 (NOTE-2)	FILLER PASS: ER347/ E347-15/16 (NOTE-2)	ROOT PASS: ER347 / E347-15/16 (NOTE-2)	FILLER PASS : ER347/ E347-15/16 (NOTE-2)
	FILLET JOINT/SOCKET JOINT: E347-15/16 / ER347 (NOTE-2)			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	ASME B31.3			
GASES	PURGING: - ARGON		SHIELDING: ARGON	
GAS COMPOSITION	PURGING: - 99.995 %		SHIELDING: 99.995 %	
PREHEATING	PREHEAT TEMP: 40 °C		INTERPASS TEMP.: 175°C MAX.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	ASME B31.3			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**
2. **CARBON CONTENT OF WELDING CONSUMABLES SHALL BE GREATER THAN OR EQUAL TO 0.04 WT.%.**
3. **FERRITE CONTENT SHALL BE CHECKED DURING PQR AND SHALL BE IN THE RANGE OF 3-8 PERCENT.**

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WSC FOR PIPING CLASSES: **B51Q, B59Q, F51Q, F52Q, F59Q, G59Q**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM B423 UNS N08825, ASTM B705 UNSN08825**		
	FITTINGS	**ASTM B564, ASTM B366 WPNICMC-S UNS N08825, ASTM B366WPNICMC-WX UNS N08825,**		
	FLANGES	**ASTM B 564 ANNLD (UNS N08825),**		
	OTHERS	-		
BASE METAL `P' NO	**45**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ERNiCrMo-3 (NOTE-2)**	FILLER PASS: **ERNiCrMo-3/ ENiCrMo-3 (NOTE-2)**	ROOT PASS: **ERNiCrMo-3 (NOTE-2)**	FILLER PASS **ERNiCrMo-3/ ENiCrMo-3 (NOTE-2)**
	FILLET JOINT/SOCKET JOINT: **ENiCrMo-3 (NOTE-2)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: - **99.995%**		SHIELDING: **99.995%**	
PREHEATING	PREHEAT TEMP: **10 ºC**		INTERPASS TEMP.: **150 ºC**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **GTAW SHALL BE EMPLOYED FOR ENTIRE WELDING OF SMALL BORE PIPING, DIAMETER 2" AND SMALLER.**

2. **SPECIAL REQUIREMENTS APPLICABLE FOR ALLOY 825 MATERIALS AS SPECIFIED IN LICENSOR (M/S CLG) SPECIFICATION RA-260816 AND CPM-SU-5013 SHALL ALSO BE COMPLIED.**

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WSC FOR PIPING CLASSES: **A27M, A74M**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A 516 GR.70 + 3MM SS410S**		
	FITTINGS	**ASTM A 516 GR.70 + 3MM SS410S**		
	FLANGES	**ASTM A 105 + 3MM 410S DEP**		
	OTHERS	**-**		
BASE METAL `P' NO	**1 + 8**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW**	ROOTPASS: **GTAW**	FILLER PASS:
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ERNiCrMo-3 (NOTE-1, 2)**	FILLER PASS: **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**	ROOT PASS: **ERNiCrMo-3 (NOTE-1, 2)**	FILLER PASS : **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**
	FILLET JOINT/SOCKET JOINT: **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: - **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **40 °C**		INTERPASS TEMP.: **175°C MAX**.	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **ER309MoL ROD CAN BE USED FOR ROOT AND FIRST PASS (HOT PASS) PASS WELDING. E7018 ELECTRODE SHALL BE USED FOR CARBON STEEL SECTION.**
2. **DURING WELDING OF GRADE 321 TO ANY CLAD PIPING COMPONENTS, ERNiCrMo-3 & ENiCrMo-3 SHALL BE USED.**

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WSC FOR PIPING CLASSES: A27N

MATERIAL SPECIFICATIONS	PIPES	**ASTM A 516 GR.70 + 3MM SS316L**		
	FITTINGS	**ASTM A 516 GR.70 + 3MM SS316L**		
	FLANGES	**ASTM A 105 + 3MM SS316L DEP**		
	OTHERS	**-**		
BASE METAL `P' NO	**1 + 8**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW**	ROOTPASS: **GTAW**	FILLER PASS:
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER316L-3 (NOTE-1, 2)**	FILLER PASS: **ER316L / E316L-15/16 (NOTE-1, 2)**	ROOT PASS: **ER316L (NOTE-1, 2)**	FILLER PASS **ER316L / E316L-15/16 (NOTE-1, 2)**
	FILLET JOINT/SOCKET JOINT: **ER316L / E316L-15/16 (NOTE-1, 2)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: - **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **40 °C**		INTERPASS TEMP.: **175°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **ER309MoL BARRIED LAYER SHALL BE USED BETWEEN ROOT AND FILLER PASS WELDING. E7018 ELECTRODE SHALL BE USED FOR CARBON STEEL SECTION.**
2. **DURING WELDING OF GRADE 316L TO ANY A27N (PIPING CLASS) CLAD PIPING COMPONENTS, ERNiCrFe-3 & ENiCrFe-3 SHALL BE USED.**

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WSC FOR PIPING CLASSES: B77M				
MATERIAL SPECIFICATIONS	PIPES	**ASTM A387GR.22CL.2+3MM 410S**		
	FITTINGS	**ASTM A387GR.22CL.2+3MM 410S**		
	FLANGES	**A182GR.F22CL.3+3MM 410S DEP**		
	OTHERS	-		
BASE METAL `P' NO	**5 + 8**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW**	ROOTPASS: **GTAW**	FILLER PASS:
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ERNiCrMo-3 (NOTE-1, 2)**	FILLER PASS: **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**	ROOT PASS: **ERNiCrMo-3 (NOTE-1, 2)**	FILLER PASS : **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**
	FILLET JOINT/SOCKET JOINT: **ERNiCrMo-3/ ENiCrMo-3 (NOTE-1, 2)**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: - **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **10 °C**		INTERPASS TEMP.: **175°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **DURING WELDING OF GRADE 321 TO ANY CLAD PIPING COMPONENTS, ERNiCrMo-3 & ENiCrMo-3 SHALL BE USED.**
2. **PWHT SHALL BE DONE AFTER WELDING AS PER LATEST EDITION OF ASME B31.3 FOR ALL WALLTHICKNESSES. HARDNESS OF HAZ OF P22 MATERIAL SIDE SHALL BE 241 BHN MAX AND MEASURED AFTER PWHT.**

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WSC FOR PIPING CLASSES: **B21Q**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM B 167 (UNS N06600)**		
	FITTINGS	**ASTM B 366 GR.WPNCI-S(N06600)**		
	FLANGES	**ASTM B 564 (UNS N06600)**		
	OTHERS	-		
BASE METAL `P' NO	**43**			
WELDING PROCESS	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ERNiCr-3/ ERNiCrFe-5**	FILLER PASS: **ERNiCr-3/ ERNiCrFe-5/ ENiCrFe-2**	ROOT PASS: **ERNiCr-3/ ERNiCrFe-5**	FILLER PASS : **ERNiCr-3/ ERNiCrFe-5/ ENiCrFe-2**
	FILLET JOINT/SOCKET JOINT: **ENiCrFe-2/ERNiCr-3/ ERNiCrFe-5**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **- ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **10 °C MIN.**		INTERPASS TEMP.: **150°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

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WSC FOR PIPING CLASSES: **D20Q**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM B 167 (UNS N06600)**		
	FITTINGS	**ASTM B 564 (UNS N06600), ASTM B 366 GR.WPNCI-S(N06600), ASTM B 366 GR.WPNCIWX(N06600)**		
	FLANGES	**ASTM B 564 (UNS N06600)**		
	OTHERS	-		
BASE METAL `P' NO	**43**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/SMAW (NOTE-1)**
	FILLET JOINTS/ SOCKET JOINTS: **SMAW/GTAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ERNiCr-3/ ERNiCrFe-5**	FILLER PASS: **ERNiCr-3/** ERNiCrFe-5/ **ENiCrFe-2**	ROOT PASS: **ERNiCr-3/ ERNiCrFe-5**	FILLER PASS : **ERNiCr-3/ ERNiCrFe-5/ ENiCrFe-2**
	FILLET JOINT/SOCKET JOINT: : **ENiCrFe-2/ERNiCr-3/ ERNiCrFe-5**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING**: - ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **99.995 %**		SHIELDING: **99.995 %**	
PREHEATING	PREHEAT TEMP: **10 °C MIN.**		INTERPASS TEMP.: **150°C MAX.**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN:	AVERAGE:
	AT TEMPERATURE:		-	
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3 & IBR**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

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WSC FOR PIPING CLASSES: **A21P, B21P**				
MATERIAL SPECIFICATIONS	PIPES	**ASTM B 729 ANNLD (UNS NO. N08020)**		
	FITTINGS	**ASTM B 366 ANLD WP20CB-S N08020, ASTM B 462 UNS NO. N08020**		
	FLANGES	**ASTM B 462 UNS NO. N08020**		
	OTHERS	**-**		
BASE METAL `P' NO	**45**			
WELDING PROCESS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **GTAW**	FILLERPASS: **GTAW/SMAW (NOTE-1)**	ROOTPASS: **GTAW**	FILLER PASS: **GTAW/ SMAW**
	FILLET JOINTS/ SOCKET JOINTS: **GTAW/SMAW**			
WELDING MATERIALS	**GROOVE JOINTS**			
	BUTT		**OTHER THAN BUTT**	
	ROOT PASS: **ER320LR**	FILLER PASS: **ER320LR/ E320LR**	ROOT PASS: **ER320LR**	FILLER PASS: **E320LR**
	FILLET JOINT/SOCKET JOINT: **ER320LR/ E320LR**			
	BACKING RING: -		CONSUMABLE INSERT: -	
JOINT PREPARATION	**ASME B31.3**			
GASES	PURGING: **ARGON**		SHIELDING: **ARGON**	
GAS COMPOSITION	PURGING: **99.995**%		SHIELDING: **99.995** %	
PREHEATING	PREHEAT TEMP: **10 °C**		INTERPASS: **175°C MAX**	
POST HEATING: -				
POST WELD HEAT TREATMENT	HOLDING TEMP: -		HOLDING TIME: -	
	RATE OF HEATING: -		MIN. HOLDING TIME: -	
	METHOD OF COOLING: -		RATE OF COOLING: -	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY `V' NOTCH VALUE:		MIN: -	AVERAGE: -
	AT TEMPERATURE:			
	HARDNESS: -			
CODE OF FABRICATION	**ASME B31.3**			

TECHNICAL NOTES:

1. **FOR PIPING SIZES 2" OD AND BELOW SHALL BE ENTIRELY WELDED BY GTAW PROCESS.**

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JOB SPECIFICATION FOR PRETREATMENT CUM ON-STREAM CLEANING OF RECIRCULATING FRESH COOLING WATER SYSTEM (SMMS)

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

EPCM : ENGINEERS INDIA LIMITED

JOB NO : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
B	18/12/2024	ISSUED FOR TENDER	JATIN	SAHIL	S. SRIDHAR
A	25/11/2024	ISSUED FOR FEED	JATIN	SAHIL	S. SRIDHAR

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CONTENT

1.0 GENERAL
2.0 PRE-TREATMENT INSPECTION
3.0 FLUSHING
4.0 CLEANING WITH LOW pH WATER
5.0 PHOSPHATE / PHOSPHONATE CLEANING CUM PASSIVATION
6.0 MONITORING
7.0 PRE-TREATMENT EVALUATION
8.0 SPECIFICATION OF CHEMICALS
9.0 SAFETY PRECAUTION
10.0 TECHNICAL SUPERVISION

ANNEXURE-I: TEST PROCEDURE FOR INHIBITOR EFFICIENCY

Abbreviations:

CS	:	Carbon Steel
CW	:	Cooling Water
CI	:	Corrosion Inhibitor
HEDP	:	Hydroxy Ethylidene Diphosphonic acid
SHMP	:	Sodium Hexa-Meta Phosphate
ATMP	:	Amino Tri-Methylene Phosphoric acid
TSS	:	Total suspended solids

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1.0 GENERAL

1.1 This recommended procedure provides the measures for on-stream cleaning and passivation of CS metal surfaces of CW system. The pretreatment involves two steps as follows:

i. Thorough cleaning of the metal surface.

ii. Development of a protective (passive) film on the metal surface.

Pre-treatment applies to all metals except SS (Stainless Steel) and SDSS but is directed primarily to CS surfaces. Pre-treatment applies to pipeline, piping, coolers and any equipment which will come in contact with the cooling water.

Exchangers whose cooling water side MOC is other than CS (like SS & SDSS) need not be included for cleaning cum passivation procedure as per this procedure.

1.2 This specification defines the procedure for the chemical cleaning and passivation. However, EPC/LSTK Contractor shall prepare the detailed chemical cleaning markup on the applicable P&IDs and submit for EIL review & approval.

1.3 Normally microbiological fouling, deposits of phosphates, iron oxides and calcium carbonate scales are expected on CW side. For effective film formation/maintenance by the CI, the metal surfaces shall be free from the foulants and deposits. Fouled surfaces can give rise to severe pitting and localized corrosion.

1.4 Pre-cleaning cum passivation shall be applied to the entire CW system.

1.5 After the pre-treatment is over, the system shall be rapidly switched over to the regular chemical treatment by a suitable specialized CW treatment chemical agency for continuous protection of passivated CW exchangers.

1.6 In case of pre-cleaning cum passivation of isolated units (like new units in an existing plant or non-availability of cooling tower sump/pumps), contractor shall arrange the following:

a) Temporary tanks of suitable volume.
b) Pumps (1 working + 1 standby) of suitable capacity and head to maintain min. flow velocity of 1.5 m/s and full bore flow.
c) Temporary piping from temporary tank to unit cooling water inlet and outlet headers.

1.7 Where lines are required to be chemically cleaned, the limit of cleaning in branch lines (which are not marked or not necessary) shall be to the first block valve or flange.

2.0 PRE-TREATMENT INSPECTION

Prior to pre-treatment, the equipment shall be inspected and if found to contain excessive corrosion products, deposits or foulant, the equipment shall be cleaned with an appropriate cleaning procedure. The CW treatment vendor shall ensure the completion of the cleaning and inspection.

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3.0 FLUSHING

3.1 Cooling tower basin and sump should be filled with fresh water, drained and cleaned. All sludge should be mechanically removed if required.

3.2 All coolers/exchangers shall be kept isolated during entire period of flushing. Prior to the flushing, jump-over shall be provided at the inlet & outlet of the exchangers in such a manner that exchangers can be taken into line at a later stage quickly.

3.3 Provision shall be made to flush out water at dead ends of all units. Permanent dummying /capping of farthest ends of CW circuits (both supply and return headers) shall be carried out only after flushing of the circuits. Necessary temporary piping to discharge chemical cleaning effluent away from process units shall be made by the contractor.

3.4 Start filling the system with fresh water for open flushing. Open flushing is to be carried out thoroughly to remove all extraneous matter, loose scales, corrosion products, microbiological debris, mud, lumber chips, paper etc from entire CW system. Once the system is filled, return water to the CW tower is to be drained from the blow down valves. Also, intermittent blowdown from lowest drain points in the unit shall be done during open flushing. Flushing is to be carried out till return water is visibly clear.

3.5 Fill the system with fresh water with the blow down valve closed and start circulating the water. All exchangers shall remain offline. Intermittent blow down are to be carried out from cell basin and from the unit lowest points.

3.6 Open the blow down valve and flush the system with fresh raw water make up for 24 hours. At the end of closed flushing, blow down water quality shall be equal to make-up fresh water.

4.0 CLEANING WITH LOW pH WATER

4.1 All the equipment, headers, piping and coolers shall be taken into circuit and the system shall be put into circulation. Blow down shall be stopped. However coolers/exchangers shall be kept isolated during the initial stage for the first 24 hrs of low pH cleaning.

4.2 The pH of circulating water shall be adjusted in the range of 4.5-5.0 by addition of sulphuric acid.

4.3 Before addition of acid for low pH cleaning, approx. 1% or manufacturers recommended dosage of Corrosion Inhibitor (Rodine-92 or equivalent) shall be added to sulphuric acid. Prior to the start of chemical cleaning, Contractor shall demonstrate the efficiency of CI by using CS coupons dipped in non inhibited and inhibited acid solutions as per the annexure-I.

4.4 The pH shall be held in this range for at least 24 hours. Intermittent blow down/draining is required from blinded or isolated lines, equipments, exchangers etc.

4.5 Thereafter blow down is to be carried out to reduce TSS & iron content. Those lines which are isolated or blinded shall be thoroughly open flushed. Subsequently, makeup water is added to raise the pH to 6.5. Blow down is to be carried out till TSS and iron content of make-up and effluent water are same.

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4.6 All jump-over provided at exchangers are to be removed and exchangers are to be taken into line.

4.7 The pH shall be adjusted to 5.0-5.5 by addition of inhibited acid and circulation shall be continued.

4.8 After 48 hours of circulation, blow down shall be started & continued till suspended solids/Turbidity are < 30 mg/l/30 NTU or close to the make-up water quality.

5.0 PHOSPHATE / PHOSPHONATE CLEANING CUM PASSIVATION

5.1 The pH of the circulating water shall be adjusted in the range of 7.5- 8.0 by reducing the acid dose and shall be held in this range throughout the phosphate / phosphonate cleaning operation. All blow down from the system shall be closed.

5.2 Organo Phosphonate HEDP shall be added by gravity to build up a level of 80-100 mg/l as PO_4. HEDP shall be dosed very slowly as this will depress the pH of the CW. If necessary, caustic soda may be added in CW system to maintain pH in the range of 7.5-8.0.

5.3 SHMP solution shall be added to build up a level of 40-50 mg/l as PO_4 .SHMP shall be dosed after HEDP addition is complete and pH is stabilized.

5.4 When phosphate / phosphonate levels and pH are stabilized, preferably ethylene oxide based non-ionic surfactant or alkyl aryl sulphonate based anionic surface active agents @ 30 mg/l (based on total hold up) shall be dosed slowly. This shall also be dosed at the same rate again after 24 hours. This will produce foam in the system. Hence precautions shall be taken for operation of CW pumps.

5.5 Circulation shall be continued under this condition for a period of 7 days and following levels of chemicals shall be maintained in the CW system for this period:

SHMP as PO_4	40-50 mg/l
Organo phosphonate as PO_4 (HEDP,50-60% active acid content)	80-100 mg/l
pH	7.5 –8.0
Non ionic/anionic surfactant (the calculated quantity shall be based on 30 mg/l and added twice only as given in sub clause 5.4)	30 mg/l

5.6 After circulating for 7 days, the system shall be given a heavy blow down without pH adjustment. Regular treatment shall be started when TSS is less than 30 mg/l or close to make up water quality and HEDP is less than 10mg/l as PO_4.

6.0 MONITORING

The pH, phosphate and phosphonate levels shall be monitored regularly throughout the entire operation and recommended levels shall be maintained.

Frequency of analysis is as follows:

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During cleaning with low pH water (clause 4.0) *

pH	:	Once in two hours
TSS/Turbidity	:	Once in four hours
Iron content (Fe)	:	Once in four hours

During phosphate cleaning (clause 5.0) *

pH	:	Once in two hours
Inorganic phosphate	:	Once in two hours
Organic phosphate (Phosphonate)	:	Once in four hours
Iron content (Fe)	:	Once in four hours

*One sample from each unit shall also be collected for analysis.

Before starting the pre-cleaning, contractor shall submit all necessary laboratory analysis procedures for review. Contractor shall make arrangements to set-up a fully equipped laboratory with all the necessary chemicals and instruments along with a qualified chemist prior to the start-up for pre-cleaning. Supply of all the reagents and chemicals are in contractors' scope.

7.0 PRE-TREATMENT EVALUATION

To assure that cleaning and passivation have been effective, a slightly rusted CS corrosion specimen shall be inserted into standard coupon testing assembly fitted to the CW return line or the specimen may be immersed in the cold water channel of the cooling tower and shall be inspected visually from time to time. A standard corrosion coupon may be inserted in the corrosion rack at the cooling tower. This may be used to evaluate the efficiency of the passivation along with the rusted coupon observation. Standard coupon shall show a thin uniform passivation layer. Cleaned and passivated surfaces of any piping or exchangers shall contain no loose rust.

8.0 SPECIFICATION OF CHEMICALS

The chemicals shall conform to the following specifications:

Organo phosphonate (HEDP, active acid content 50-60%)	Testing as per ASTM D515-72 and To be obtained from reputed manufacturer.
SHMP	IS : 574 (latest)
H_2SO_4 (98%)	IS : 266 (latest)
Caustic Soda	Technical grade as per IS:252 (latest)

Contractor shall submit relevant test certificates of his chemicals as a proof of presence of minimum active ingredients in the respective chemical products.

9.0 SAFETY PRECAUTIONS

Normal safety precautions shall be taken for handling of chemicals. Protective clothing and safety items shall be used to prevent any injury during the pre-treatment

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operation. Temporary barricades shall be provided around the area where acid and alkali is being handled and entry in to the barricaded area shall be strict with proper safety gears. Contractor shall bring only flame proof pumps and equipment.

NOTES:

1. CW System shall be started with the above pre-treatment program prior to normal treatment.
2. HEDP shall only be used. ATMP shall not be used.
3. During on-stream cleaning, if CW temperature exceeds 40^0C, SHMP level as specified in sub clause nos. 5.3 and 5.5 shall be reduced to 20-25mg/l as PO_4.
4. Approximate chemicals requirement for 1000 m^3 hold up of CW system:

Organo phosphonate (HEDP, active acid content 50-60%)	140-180 Kg to maintain level of 80-100 mg/l as PO_4
SHMP	50-60 Kg to maintain a level of 40-50 mg/l as PO_4
Surfactant	30 Kg To maintain a level of 30 mg/l

Actual requirement of chemicals shall be calculated based on actual hold-up of the system and dosage to maintain specified levels. Further additions of chemicals will depend on laboratory results and to be dosed to maintain specified levels for entire operation.

10.0 TECHNICAL SUPERVISION

The chemical cleaning operation shall be conducted under close chemical controls by the contractor and EIL site. The EIL site may have technical guidance from SMMS.

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ANNEXURE-I

TEST PROCEDURE FOR INHIBITOR EFFICIENCY

1.0 PREPARATION OF TEST COUPONS

CS coupons of size 7.5cm x 5cm shall be cut from hot rolled (AISI 1020 or equivalent grade) steel strip or plate. The edges and sharp corners shall be ground smooth. A 5mm diameter hole shall be provided for suspension. The coupons thus prepared shall be used in the tests.

2.0 IDENTIFICATION

The coupons shall be provided with letters and/ or number at one corner using punch.

3.0 SURFACE PREPARATION

For conducting the test to determine inhibitor efficiency, the coupons shall be free from mill-scale by grinding followed by polishing using emery paper. The final surface shall be made bright using emery paper. Coupons for conducting the test of action of cleaning solution in removing mill-scale shall be with the mill scale on. All the coupons shall be weighed separately correct to 1mg using a balance.

4.0 CLEANING SOLUTION

The cleaning solution is the inhibited sulphuric acid. Before addition of acid for low pH cleaning, approx. 1% (or in recommend dosage) CI shall be added to sulphuric acid. The pH of sulphuric acid solution shall be in the range of 4.5-5.0.The solution thus prepared, shall be used for conducting the tests.

5.0 TESTS FOR INHIBITOR EFFICIENCY

Test shall be carried out in duplicates in glass containers preferably in one litre capacity beakers. One litre of cleaning solution each shall be transferred to beakers and the solution shall be heated to the maximum temperature in the specified range for the process. The coupons shall be completely exposed to the action of the acid by suspension from the hole so that the upper edge shall be at least 1cm below the liquid surface. The temperature shall be held as above through-out the duration of the test.

5.1 Identical test shall be carried out using un-inhibited acid of the strength equivalent to that of the cleaning solution.

5.2 After the exposure of the coupons to the cleaning solution for the duration of actual cleaning, all the coupons shall be removed from the acid solution and cleaned in running tap water to remove acid and finally in distilled water. The coupons shall be dried and transferred to desiccator before weighing.

5.3 The weight loss of the coupons shall be determined and the corrosion rates shall be calculated. The average corrosion rate of the coupons exposed to the cleaning solution shall be less than 3% of the average rate thus obtained for the coupons exposed to un-inhibited acid. (I.e. percent corrosion inhibition shall be 97% (min.). Approval of the Engineer-in-Charge shall be obtained for the inhibitor efficiency obtained in the test.

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TECHNICAL SPECIFICATION FOR COATING OF UNDERGROUND STAINLESS STEEL/ ALLOY STEEL PIPING

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	16-05-2025	Issued as job specification	JATIN	SAHIL	SRIDHAR

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1.0 SCOPE

This Specification outlines minimum requirements for external painting of underground SS and Alloy Steel plant piping. This specification covers surface preparation, details about coating system, application methods & pre-qualification testing requirements etc.

2.0 REFERENCE CODES & STANDARDS

The latest editions and revisions of the following Standards shall be used to supplement and define the intentions and requirements of this Specification.

Swedish Standard
SIS 05 59 00 Pictorial Surface Preparation Standards for Painting Steel Surfaces.

American Steel Structures Painting Council Standards
SSPC - PA2 Measurement of Dry Paint Thickness with Magnetic Gauges
SSPC- SP16 Brush-off Blast for SS, galvanized steel and non-ferrous metals

International Standards
ISO 12944-1 Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 1: General introduction
ISO 12944-3 Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 3: Design considerations
ISO 12944-4 Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 4: Types of surfaces and surface preparation
ISO 12944-5 Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 5: Protective paint systems
ISO 12944-6 Paints and varnishes -- Corrosion protection of steel structures by protective paint systems -- Part 6: Laboratory performance test methods.
ISO 12944-8 Paints and varnishes -- Corrosion protection of steel structures by
ISO 8501-1 Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness. Part 1: Rust grades and preparation grades of uncoated steel substrates and steel substrates after overall removal of previous coatings
ISO 8504-2 Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 2, Abrasive blast-cleaning
ISO 2808 Paints and Varnishes - Determination of film thickness

3.0 EQUIPMENT

All tools, brushes, rollers, spray guns, blast material, hand power tools for cleaning and all equipments, scaffolding materials, shot & grit blasting equipments & air compressors etc. required to be used shall be suitable for the work and all in good condition and shall be arranged by the contractor at site and in sufficient quantity.
Mechanical mixer shall be used for paint mixing operations in case of two pack systems except that the Engineer-In-Charge may allow the hand mixing of small quantities at his discretion in case of specific requirement for touch up work only.

4.0 GENERAL SEQUENCE FOR SURFACE PREPARATION & PAINTING

4.1 Pre-blasting prior to removal for weld splatters.

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4.2 Emulsifying cleaning.
4.3 DM water washing, to remove contaminants
4.4 Shot & Grit blasting
4.5 Dust and grit removal
4.6 Paint application
4.7 Inspection

5.0 PROCEDURE FOR PRE-BLASTING PREPARATION & SURFACE PREPARATION

Pre-blasting

All Sharp edges (if any) shall be rounded by using grinder or disc sander to get minimum 2mm radius (R = 2mm). This can be obtained by way of three passes with the grinding tool on the sharp edges. Weld slag, spatters & weld beads shall be thoroughly removed by chipping and grinding. Under cuts and surface indentations depth exceeding 0.8mm and a width less than its depth should be rectified by welding and grinding (including weld blow holes). Rough weld seam (if any) shall be smoothening by grinding. Overlap weld beads with the sharp notches are to be repaired by welding and grinding.

In case of any localized oil contamination to the surface, same shall be removed by solvent, alkaline detergent or emulsifying agent cleaning as per SSPC-SP-1.

Removal of oil and grease is followed by fresh water washing, to remove contaminants, (soluble salt and welding flux, dirt).

Note: To remove the soluble salt, dirt, and dust, high pressure water cleaning up to a pressure of minimum 250 Bar is required.

Surface preparation

Surfaces to be coated shall be blast cleaned in accordance with SSPC-SP-16. The surfaces shall be blast cleaned using abrasives like Al_2O_3/garnet or non-metallic abrasives at pressure of 7kg/cm^2 at an appropriate distance and angle depending of nozzle size maintaining constant velocity and pressure. The quality of abrasives shall be free from contaminants and impurities and shall meet the requirements of SSPC AB1. Compressed air shall be free from moisture and oil. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the materials for liners. Nozzles orifice may vary from 3/16" to ¾". Blast cleaning shall not be done outdoors in bad weather without adequate protection or when there is dew on the metal, which is to be cleaned. Surface profile shall be uniform to provide good key to the paint adhesion. If possible vacuum collector shall be installed for collecting the abrasives and recycling.
Blast cleaning shall not be performed where dust can contaminate surfaces or during humid weather conditions having humidity exceed 85%

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6.0 COATING SYSTEM

Table-1

Sl. No.	Surface Preparation	Coating System			DFT (µm)
		Primer	Intermediate	Finish coat	
1.1	**For Stainless Steel piping**				
1.1.1	SSPC-SP-16 Min. 50 microns profile	1 coat of Novolac Epoxy phenolic coating (F-17) @300 microns	-	1 coat of Novolac Epoxy phenolic coating (F-17) @300 microns	600 µ min.
1.2	**For Alloy Steel piping**				
1.2.1	SSPC-SP-16 Min. 50 microns profile	1 coat of glass flake epoxy composite coating @ 150 microns	-	1 coat of glass flake epoxy composite coating @ 150 microns	300 µ min.

7.0 GENERIC PRODUCTS' DESCRIPTION

7.1 Novolac Epoxy coating

Generic name: Novolac epoxy phenolic coating cured with Polyamine adduct hardener.
Properties of the coating shall conform to code F-17 specified in table-2 of B957-000-06-42-PLS-01.

7.2 Glass Flake Epoxy Composite coating

Generic name: Two component glass flake reinforced epoxy composite coating having volume solids of min. 70±2 %. This coating shall be suitable for heat resistance up to 250 Deg. C in buried condition.
Mixing and thinning shall be as per manufacturer's recommendation.

8.0 COATING APPLICATION

Primer/first coat of paint shall be applied within 3-4 hours of surface preparation.
All coating shall be applied by airless spray excepting at the following special cases where application can be carried out by brush

- Spot repair
- Stripe coating on edges
- Small bore parts not suitable for spray application.

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Irregular surfaces such as sharp edges, welds, small brackets, and interstices may stripe coated to ensure specified DFT is achieved. Paint manufacturer recommendation should be followed before deciding for brush application.

9.0 QUALITY CONTROL, INSPECTION AND TESTING

The painting work shall be subject to inspection by Engineer-In-Charge at all times. In particular, following stage-wise inspection will be performed and contractor shall offer the work for inspection and approval of every stage before proceeding with the next stage. The record of inspection shall be maintained in the registers. Stages of inspection are as follows

(a) Surface preparation
(b) Primer application
(c) Each coat of paint

a. Test for presence of oil/grease and contamination

The steel substrate after degreasing as per SSPC-SP-1 shall be tested as per following procedure to validate absence of oil and grease contamination:

- Visual inspection - continue degreasing until all visible signs of contamination are removed.

- Conduct a solvent evaporation test by applying several drops or a small splash of residue-free tri-chloromethane on the suspect area especially pitting, crevice corrosion areas or depressed areas. An evaporation ring formation is indicative of oil and grease contamination. Continue degreasing and inspection till test is passed.

b. **Tests for surface finish of blasted surface** shall be done by visual inspection using SSPC-VIS1. Clear cellophane tape test as per ISO 8502-3 shall be used to confirm absence of dust on blasted surface. Checks shall be done on each component at least once per 200 m^2 of blasted surface and a minimum of 3 checks per shift.

c. **Test for presence of soluble salts** as per method ISO 8502-9. Maximum allowable salt content shall be considered 20 mg/m2.Checks shall be done on each component at least once per 200 m2 of blasted surface and minimum of 3 checks per shift. In case salt exceeds specified limit, the contaminated surface shall be cleaned by method as per Annexure-C of ISO 12944-4 (water cleaning). After cleaning, surface shall be retested for salt after drying.

d. **Blast Profile Measurement**: (In-Process testing during actual production before application coating). The angular profile depth measurement shall be done by profile tape as per method ASTM D 4417 method B (Profile depth gauge micrometer)/ calibrated Digital gauge meter. Spot measurement shall be carried out every 15m^2 of blasted surface. At each spot three measurements shall be taken over an area of 10

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m^2 and average of measurements to be recorded and reported. If profile is less than specified range, blasting shall continue till greater specified depth profile is achieved.

e. **Tests for blasting media:** Blasting Media (For every fresh batch of media and one random test during blasting)**.** Blasting Media shall be visually inspected for absence of contamination and debris using 10 X magnification.

- Inspection for the absence of oil contamination shall be conducted using following procedure:
  - Fill a small clean 200 ml bottle half full of abrasive.
  - Fill the bottle with potable water, cap and shake the bottle.
  - Inspect water for oil film/slick. If present, the blasting media is not to be used.

- Soluble salt contamination if suspected shall be verified by method ASTM D 4940. If present, media to be replaced.

- Clean blasting equipment, especially pot and hoses, and then replace blasting media and retest.

f. **Test for Blasting Air** (Once Daily before start of blasting and once at random during Blasting). The air for blasting shall be free from moisture and oil. The compressor air shall be checked for oil and water contamination per ASTM D 4285.

In addition to above, record should include type of shop primer already applied on equipment e.g. zinc silicate or zinc rich epoxy or zinc phosphate. Any defect noticed during the various stages of inspection shall be rectified by the CONTRACTOR to the entire satisfaction of Engineer-In-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work, CONTRACTOR shall be responsible for rectifying any defects found during final inspection/guarantee period/defect liability period as defined in general conditions of the contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to OWNER, the extra coat should have prior approval of Engineer-in-charge.

9.1 Primer Application

After surface preparation, the primer should be applied to cover the crevices, corners, sharp edges etc. in the presence of inspector nominated by Engineer-In-Charge.

9.2 The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring.

Surface profile gauge for checking of surface profile, Dry film thickness (of each coat), Holiday detectors / pinhole detector and protector whenever required for checking

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9.3 At the discretion of Engineer-In-Charge, the paint manufacturer must provide the expert technical service at site as and when required. This service should be free of cost and without any obligation to the owner, as it would be in the interest of the manufacturer to ensure that both surface preparation and application are carried out as per their recommendations. The contractor is responsible to arrange the same.

9.4 Final inspection of finished coating shall consist of measurement of:

- **Coating DFT & WFT check:** DFT measurement shall be as per ISO 2808. Type-II electronic gauge shall be used as described in ASTM D7091. DFT gauge calibration, adjustment of gauge coating thickness, frequency and number of coating thickness measurement shall be as per ASTM D7091 and SSPC-PA2. Measured DFT shall have a tolerance as per SSPC-PA-2 level-3 of the dry film thickness, specified in this specification. Once in every layer of coating application, spot checks of WFT shall be carried out during the coating application according to ISO 2808, Method No. 1A- comb gauge. This is to ensure that film thickness is being achieved as per the specification. The frequency of WFT check shall be one per 10 m^2.

- **Adhesion testing:** Adhesion of the primer to the steel substrate and inter-coat adhesion of the subsequent coat(s) after curing for at least a week after application of the topcoat shall be examined by a knife test in accordance with ASTM D6677. For the knife test, if the rating is better than 8, the adhesion is considered acceptable. The adhesion is destructive and tested areas shall be repaired afterward using the spot repair procedure. Alternatively, the applicator may perform the adhesion test on a steel panel coated using the same surface preparation and coating application procedure as the work piece. Adhesion testing shall be carried out for each component at least once per 200 m^2 of coated surface.

- **Holiday detection check:** Holiday testing of non-conductive coatings shall be carried out in accordance with NACE SP0188. For immersion, buried & under insulation services, 100% of coated area shall be inspected for holidays. For atmospheric exposure, 10% of coated area which must include weld seams, corners and edges to be holiday tested. Voltage at which test is to be carried out will depend upon DFT of coating being tested and shall be as per NACE SP0188. Any holiday is unacceptable and should be marked and repaired immediately**.**

- The CONTRACTOR shall arrange for spot checking of paint materials for specific gravity, glow time (ford cup) and spreading rate.

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10.0 Pre Qualification of the coating materials

For Novolac epoxy phenolic coating, the paint manufacturer engaged by the mechanical contractor shall carry out the tests in NABL accredited government laboratories or in suggested list of laboratories below, as a part of qualification. Paint manufacturer shall provide the paint samples to laboratory for testing of the parameters mentioned in Table-2 of B957-000-06-42-PLS-01 (typical characteristics of F-17) and Table-2 of this specification. The testing laboratory will confirm the compliance of the paint material with respect to the acceptance criteria mentioned in the respective tables.
For Glass Flake Epoxy Composite coating, the paint manufacturer engaged by the mechanical contractor shall carry out the tests as per Table-2 and properties mentioned in product datasheet in any NABL accredited laboratories or in suggested list of laboratories below, as a part of qualification. The test certificates shall be certified by a NACE/AMPP Level-3 certified inspector of a qualified TPI agency.

Colored photographs of coated test panels should be taken before and after the test and should be enclosed along with test report. Contractor shall furnish these test certificates along with all necessary supporting documents/information to EIL-SMMS for approval/ acceptance. The paint manufacturer will be qualified and approved by EIL-SMMS for supply of paints after review/assessment of the submissions made by the contractor. Test certificates which are more than 3 years old will not be considered. Paint manufacturers are advised to carryout pre-qualification testing accordingly for paints supply to EIL projects.

List of suggested laboratories:

1. National Test house – Kolkata
2. National Test house-Mumbai
3. HBTU- Kanpur
4. GIRDA (Gujarat Industrial Research & Development Agency)- Vadodara
5. Indian institute of chemical technology – Hyderabad
6. RITES – Kolkata
7. ICT- Mumbai

Table-2

S. No.	TEST	DURATION	ACCEPTANCE CRITERIA
1.	Chemical Resistance Test (ASTM D543)		
1a.	10% & 40% NaOH	1000 hrs	Shall pass. No cracking, discoloration, blistering,
1b.	5% H2SO4	168 hrs	

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1c.	Xylene	4 weeks	peeling or softening of film shall be observed.
1d.	Acetone	4 weeks	
1e.	Ethanol	4 weeks	
1f.	Kerosene	4 weeks	
1g.	Sea water	2000 hrs	
2	Cathodic Disbondment Test (ASTM G95) for 28 days	28 days	Disbondment radius shall be max. 12mm
3	Flexibility 180^0 bend over 3-inch mandrel (ASTM D522)	-	No cracking or delamination
4	Impact Resistance (ASTM G14)	-	Average 8.4 Nm min. for 5 Samples
5	Water Absorption (ASTM D570)	-	Max 2%
6	Thermal Shock Resistance Test (For epoxy composite coating); 5 cycles @ 30 minutes in furnace at 250 º C and 15 minutes in water after quenching in water for each cycle. (ASTM D2485 method B)	-	Shall pass

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JOB SPECIFICATION FOR ANTI-FUNGAL COATING SYSTEM FOR RCC STRUCTURES

(SMMS)

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

EPCM : ENGINEERS INDIA LIMITED

JOB NO : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	07/01/2025	ISSUED AS JOB SPECIFICATION	JATIN	SAHIL	S. SRIDHAR

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CONTENTS

1.0 GENERAL

2.0 SURFACE PREPARATION

3.0 PAINT SYSTEM

4.0 APPLICATION, MIXING, THINNING

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1.0 GENERAL

This job specification covers the minimum technical requirement for surface preparation, painting of RCC exposed surfaces in plant area which are prone to carbonization as well as algae & fungus attack due to continuous exposure of water & sea water etc. This document is intended for RCC structures susceptible to dampness only and not intended for archaeological or aesthetic purpose.

2.0 SURFACE PREPARATION

Surfaces to be painted should be free from chalking. All dust, grease and lose paint, looser powder particles, fungus/algae need to be completely removed. Remove entirely the previous growth of fungus and algae if any by vigorous wire brushing and cleaning with water. The exterior surfaces should not be affected by any water seepage or by constant dampness. No painting shall be done in rainy season. It is recommended that newly plastered surfaces shall be allowed to cure at least 2 months before painting.

3.0 COATING SYSTEM

Anti-fungal Paint System for Concrete Structures (above ground):

1 Priming coat of water based 100% Acrylic exterior emulsion primer with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50µ

+

2 coats of finish coat with water based 100% acrylic exterior emulsion paint with light fast pigments and resistant to fungus and algae growth, alkali and UV degradation @ 50 µ = 2×50 = 100 µ

Total DFT = 150 µ minimum.
Note: DFT can be checked on a carbon steel panel of 1 ft × 1 ft, applied simultaneously.

4.0 APPLICATION, MIXING AND THINNING

The manufacturer's recommendations given in the printed literature shall be followed.

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INITIAL START-UP, PRE-COMMISSIONING & COMMISSIONING SPECIFICATION FOR EPCM-1 UTILITIES & OFFSITES IN BPREP

0	04.02.2026	Issued For Tender			
Rev. No.	**Date**	**Purpose**	**Prepared by**	**Reviewed by**	**Approved by**

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ANNEXURE-II	PRE-COMM ACTIVITIES NEED TO BE COMPLETED FOR DECLARING MECHANICAL COMPLETION WITHIN CONTRACTOR STIPULATED TIME FOR PROCESS SYSTEMS IN UNITS
ANNEXURE-III	PRE-COMM ACTIVITIES NEED TO BE COMPLETED FOR DECLARING MECHANICAL COMPLETION WITHIN CONTRACTOR STIPULATED TIME FOR UTILITY SYSTEMS IN UNITS

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1.0 SCOPE

Bharat Petroleum Corporation Limited (BPCL) intends Engineer, Procure, Construct, Commission and Operate "EPCM-1 Units & facilities in Bina Petchem and Refinery Expansion Project (BPREP)", at its Bina Refinery in the state of Madhya Pradesh.

The EPCM-1 Units and facilities comprise the following: -

1. Ethylene Cracker (ECU) & Associated Units

2. Utilities and Offsites (U&O)

As part of this project, EIL is preparing the Basic Design and Engineering Package (BDEP), carrying out detail ENGINEERING, PROCUREMENT AND CONSTRUCTION MANAGEMENT for all of the above-mentioned units and facilities.

Detailed scope of work of the mechanical contractor with respect to these facilities is described elsewhere in the bid document. This document provides pre-commissioning, commissioning responsibilities of the contractor.

Contractor will carry out pre-commissioning & commissioning activities (as mentioned in this document) of the facilities as stated above under the guidance / supervision of Owner/PMC operating personnel/ commissioning team. Co-ordination with other Contractors, if any, for pre-commissioning and commissioning of facilities shall be under Contractor's Scope.

Contractor to carry out all activities essential for pre-commissioning/ commissioning even if not specifically mentioned in the document including arrangement of equipment/ cranes/ hydra/ hoists/ temporary facilities/ connections/ fittings/ spools/ consumables/ tools and tackles/ special equipment for catalyst/ catalyst support loading etc.

1.1. The CONTRACTOR shall be responsible to carry out pre-commissioning and commissioning of the Unit as indicated in scope of work.

1.2. A procedure for detailed mechanical completion, pre-commissioning, commissioning and start up shall be developed by CONTRACTOR based on the inputs from the licensor and guidelines provided in this document. Also, CONTRACTOR shall prepare the start – up and shut down procedure along with operating manual of the Unit on the guidelines provided in the document.

1.3. PCAMS Software is used by EIL in start – up and commissioning. Status of all the formats shall be through PCAMS only, hence Contractor to align his system with the PCAMS software and working at site by the Contractor shall be through PCAMS only.

2.0. DEFINITIONS

2.1 MECHANICAL COMPLETION

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Mechanical Completion of systems mean that all installation works of the unit is completed and hydro tested in accordance with approved construction drawings, approved specification, applicable code/s as defined in the bid package, accepted international good engineering practice and all the pre-commissioning activities are completed in a comprehensive manner by the Contractor as detailed in section 2.2.

Contractor shall submit certificate as per FORMAT-I (attached as Annexure-I) stating system/ sub-system, which is mechanically completed along with test certificates connected with the system/sub systems viz. hydrotest reports, NDT reports, inspection certificates, certificates of various statutory bodies etc.

OWNER/ PMC/ Consultant representatives will check the system and shall issue FORMAT- II (as per format given in Annexure-I) which includes deficiencies / modifications, intimation of deviations from P& IDs, requirement of safety, start –up, Operation and Maintenance required for the portion of the work that is declared by the Contractor as mechanically complete.

Contractor shall liquidate all the checklist points agreed between Contractor / OWNER / PMC and issue certificate in form of FORMAT – III (as per format given in Annexure-I). All the coordination for resolution of P & ID issues, alarm/ trip values, interlocks and complex loop issues shall be closed by CONTRACTOR.

Contractor shall get the approval or acceptance of FORMAT-III to carry out pre-commissioning activities as mentioned in section 2.2 under the guidance / supervision of Owner / PMC.

2.2 PRE-COMMISSIONING ACTIVITIES

Pre-commissioning activities will include but will not be limited to the following:

i) Opening & box-up of piping, valves, instruments, spool pieces etc as per pre-commissioning procedure.

ii) Air blowing, cardboard blasting, water flushing, Air drying and steam blowing of pipes, vessels, equipments for clearance of box-up & maintain records for commissioning activities. In case sufficient pressure during water flushing is not available, contractor to make necessary temporary arrangement for getting the required pressure. (Inspection of all vessels and columns shall be jointly by OWNER, EIL / PMC).

iii) Fabrication and supply of temporary facilities, for example, temporary bypasses, spools, blinds, jump-overs, vents, strainers, screens etc. Fabrication/ Purchase of valve keys/ blinds and other pre-commissioning /commissioning related consumables as required.

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iv) Chemical cleaning / Passivation

v) Carry out leak test/ tightness test. Carry-out integrated leak test & maintain records. Attending leaks by tightening to the required torque/replacement of faulty gaskets where necessary.

vi) Receiving material required as per requisite format approved by EIC from owner's store/ warehouse / designated area or any other location within plant premises including loading, unloading and maintain the records.

vii) Contractor to ensure that Gaskets, stud, bolts etc. used are strictly as per piping material specification for the pipe class specified for that line.

viii) Carrying out RIGGING JOBS including dismantling/ erection of structure/ equipment, piping, etc. as per the instructions of the Engineer-in-charge.

ix) Opening & Box Up of Static Equipment / Column/ Vessel / Man ways and Pipe Line Flanges/ Heat Exchangers, Isolation, removal & re-fixing of instruments mounted on Static Equipment / Columns/ Vessels, Heat Exchangers bundle pulling and re-fixing.

x) Opening and Re-Fixing of all Type of Valves including PSVs & control valves, line mounted Instruments Including Both Ways Transportation Between Plant and Work Shop.

xi) SCAFFOLDING ERECTION AND DISMANTLING JOBS including supply and erection of temporary scaffolding & staging, making temporary platforms using pipes, pipe clamps, beam clamps etc. in conformance with established safety codes, BIS codes etc. inside/ outside of equipment like Columns, Vessels, structures etc

xii) Carrying out FILTERS, STRAINERS, STEAM TRAPS, DEMISTER PADS related jobs including removal of auxiliary connections, dropping assemblies, cleaning, finally boxing up the complete assembly with proper alignment, flushing, draining, cleaning and filling up of hydraulic oil consoles / tanks of rotary equipment, removing and cleaning all types of filters and strainers, Cleaning of area / oil spillage, after the job, Cleaning of all types of steam traps, Dropping, cleaning and re-fixing the de-mister pads after inspection, Cleaning and lubrication of fasteners, etc.

xiii) Rechecking of alignments for the rotating equipment.

xiv) Assistance to carry out checks on rotary equipment as per OEM requirement.

xv) Topping up of bearing oil/ lube oil in rotary equipment.

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xvi) Hose connections/ removal.

xvii) Opening & box-up of piping for connection & disconnection of chemical drums / iso containers & their unloading into the system.

xviii) Make cold/ hot alignments, necessary checks, adjustments, repairs required during pre- commissioning & commissioning of the system / equipment.

xix) Install, adjust and replace mechanical seals, packing and accessories, as necessary during pre-commissioning / commissioning period.

xx) Providing assistance to Vendor's Representative for equipment preparation/ repair and any other similar activity as per the commissioning requirement as per the instruction of Engineer-in-charge including supply of necessary hand tools, equipment, consumables (scaffolding, electrodes, gas) and with single point responsibility of contractor's supervision.

xxi) Carry out site modifications as found necessary during system check / inspection from view point of operability, maintenance and safety of the units.

xxii) Check pipe hangers, supports, guides and pipe specialties for hot settings and make minor adjustments as necessary.

xxiii) Carry out cleaning of vessel internal surface, distributors, supports, packing material etc as and when required.

xxiv) Instrument pre-commissioning includes all checks that will ensure instrument operability i.e. remove all shipping stops, check pointer travels, and verify instrument capability to measure, operate and stroke in the direction and manner required by the process application, conduct checking of complex loops and interlocks, instrument loop checking, instrument calibration, check for proper tagging of instruments etc.

xxv) Electrical pre-commissioning including proper earthing, pre-commissioning checks done on cable continuity checks, electrical panels, MCCs, switch gears, motors, transformers etc.

xxvi) Supplying and installation of locks and chains for locking of valves wherever required.

xxvii) To remove insulation from insulated piping, Valves, flanges etc in such a way so that these can be reused and re-fix the same after the job is completed.

xxviii) Carry out dewatering of pits / basins as directed, using electrical pump.

xxix) Maintenance & repairing of valves by a skilled valve repair mechanic.

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xxx) Dropping & reinstatement of valves by a skilled valve repair mechanic.

xxxi) Supply & Installation of barricading tape.

xxxii) Supplying safety appliances & suitable PPEs to all workers.

xxxiii) Removal of scrap to identified area, maintain housekeeping, & return material after the job completion.

xxxiv) CONTRACTOR to ensure during Pre Commissioning, all the accessories / equipment required for availability of utilities for carrying out commissioning works shall be ready at least three months before start of Commissioning activities.

xxxv) CONTRACTOR to coordinate and confirm compliance regarding completion of all, mechanical, Instruments and Electrical installation work.

xxxvi) CONTRACTOR to take trial run of Fire Water system, Gas detector system and other safety system and obtain approval of the same from OWNER/PMC/EIL.

xxxvii) To obtain necessary safety / work permits and comply with all safety norms & regulations.

xxxviii) Supplying consumables required to complete the assigned works including but not limited to the following.

- Welding consumables electrodes, filler wire, Argon gas, Al. lugs etc.
- Flame cutting consumables like DA, O2, etc.
- Cutting wheel, grinding wheel, buffing wheel
- Fuel, oil, Lubricants etc. for running contractor deployed machinery
- Emery papers
- Cardboard for cardboard blasting
- Soap solution with squeeze bottles as required for leak test.
- Plastic sheets
- Gaskets
- Aluminium /brass target plates
- Temporary Strainer SS mesh

2.3 DECLARING READY FOR COMMISSIONING

2.3.1 The unit shall be considered `Ready for Commissioning' (FORMAT – IV) when all the facilities have been completed along with their auxiliaries and support facilities in every

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respect including charging of lubes, chemicals, preparation of solution, last minute modifications, if any, as recommended by OWNER / PMC. All temporary structures, scaffolding etc. used for carrying out pre-commissioning activities shall be removed, all the blinds shall be placed into position as per P&IDs / OWNER/ PMC.

2.3.2. Contractor shall ensure that all safety devices like pressure safety valves (PSV), emergency shutdown valves are tested, witnessed and certified by representative of Contractor / OWNER/ PMC. These certificates are to be handed over to OWNER/ PMC prior to start-up of the UNIT.

2.3.3. Once the Unit has been declared “Ready for Commissioning”, the Contractor shall not carry out any erection related work including hot work without prior permission of the OWNER.

2.4 COMMISSIONING

2.4.1. Commissioning of the Unit will be carried out by Contractor once mechanical completion is over successfully, all pre- commissioning activities are carried out and system is ready for commissioning under necessary guidance and overseeing of PMC/OWNER. Representative from process designer will provide necessary co-ordination during start up and related technical clarifications shall be furnished by them.

2.4.2. Commissioning of the Unit means taking the feed in, passing it through the normal route; establishing the process control parameters first at turn down & then at design throughput stipulated in the process package (guarantee parameters as per bid document) with supplementary instructions if any from OWNER.

2.4.3. Contractor will provide necessary assistance during commissioning of the unit.

2.4.4. The Unit shall be considered to be commissioned successfully once all the system with instrumentation/ control systems and support systems have been on uninterrupted stable operation for not less than 72 hours. Any interruption of duration up to 30 minutes during the commissioning run of 72 hours shall be ignored. However, for interruptions greater than 30 minutes, the commissioning run period shall be extended by the time equal to the interruption plus the time taken to stabilize the Unit back to the normal operating conditions. Whether the 72 hours operation has been successful or not, shall be decided by the OWNER / PMC based on the observations recorded during 72 hours. The countdown for 72 hours operation shall start only after Unit has been on stable operation with all controls and safety system in normal operation for a period of not less than 48 hours. OWNER will issue acceptance certificate (Format-V) accordingly. Three months in advance of starting the commissioning, the CONTRACTOR shall submit proposal to the OWNER’s Representative giving details of

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the programme to be followed during commissioning. This shall be checked by OWNER/ PMC. The CONTRACTOR shall depute operating team comprising of commissioning co-coordinator, process/ operational co-coordinator, mechanical, electrical & instrumentation engineers, technicians/ semi skilled personnel to carryout UNIT start up & commissioning and maintenance under the overall guidance of PMC/ OWNER. OWNER shall depute operating team consisting of process operators (field and control room) and supervisors during the commissioning.

2.4.5. The CONTRACTOR shall provide manpower for pre-commissioning/ commissioning and for 6 months post commissioning of the unit. The bidder CONTRACTOR in his offer shall submit the organization manpower chart of commissioning team and the bio-data of key persons who shall be present at the time of commissioning. The bidder CONTRACTOR shall also specify the planned duration of stay of these personnel.

2.4.6. The CONTRACTOR shall also be required to provide on the job training to OWNER's operation personnel by associating them in all the day to day pre-commissioning, commissioning, maintenance activities and UNIT operations. After successful commissioning of the process Unit same shall be handed over to the OWNER for operation. In case of any constraint in achieving the above process parameters in the Unit by the CONTRACTOR, the same shall be communicated by the CONTRACTOR to the OWNER in writing. This will be reviewed jointly by OWNER/PMC to arrive at a decision on whether the constraint is on account of reasons attributable to the CONTRACTOR or not. The action in either case will be according to the relevant provisions / provided elsewhere in the contract.

2.4.7. CONTRACTOR in some cases may be required to do part commissioning of the mechanically completed sections of the UNIT as per directives from the OWNER.

2.4.8. Upon successful commissioning of the Units the same shall be taken over by the OWNER for day to day operation and maintenance only, the final take-over shall be subject to compliance to all the contractual obligations by the CONTRACTOR. Once the Unit is successfully commissioned CONTRACTOR will issue the format-V to OWNER for take-over of the Unit from CONTRACTOR.

2.5 DOCUMENTS FOR PRE COMMISSIONING / COMMISSIONING

2.5.1 Operating Manual.

The CONTRACTOR shall prepare plant specific draft-operating manual of the Cooling water system and submit to OWNER/ EIL for review at least 120 days prior to mechanical completion. Minimum five copies of draft operating manual shall be submitted by the CONTRACTOR for review.

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In particular, following information shall be covered as a minimum.

- Design basis of Cooling Water system.
- Detailed process description.
- Pre-start checks.
- Pre-commissioning procedures
- Start-up procedure.
- Normal operating procedure.
- Shutdown procedure (Normal & Emergency).
- Vendor instructions for all equipment for maintenance start up, shut down, normal operation and troubleshooting.
- Operating parameters and set points of alarms and trips.
- Operating conditions
- Effect of operating variables on the process.
- Details of interlock logic, trip etc.
- Functional description of safe shut down systems.
- List of emergencies and emergency handling procedures.
- Dosage rate of chemicals used and other related operating information.
- Initial requirement of chemicals for first start-up.
- Safe-handling precautions for chemicals used. (MSDS)
- List of equipment and their major details
- List of all instruments like control valves, transmitters etc.
- Relief valve schedule, tag numbers, set pressure, capacity basis, failure scenarios considered etc.
- Approved/ final PFDs/P&IDs and drawings
- Any other special conditions / instructions / information, etc.
- Summary of chemical consumption.
- Summary of utility consumption.
- Lubrication schedule (with equivalent lubricant available in India).
- Hydrocarbon/chlorine detection and associated safety system.

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- Laboratory analysis requirement and procedure with sampling schedule.
- Procedure for preparation of equipment hand over
- Safe handling of chemicals
- Chemical solution preparation procedures
- MSDS of chemicals

Review of operating manuals shall be done by OWNER/EIL after receipt of draft operating manuals. All the changes, additions, deletion required by the OWNER/EIL shall be communicated to CONTRACTOR and same shall be incorporated in the final operating manual by the CONTRACTOR. Ten copies of final operating manual shall be submitted by CONTRACTOR. The same shall also be forwarded in CD. The final manuals shall be submitted to OWNER at least 90 days prior to mechanical completion. These operating manuals shall be followed during start-up and commissioning of the Cooling Water System. Vendor's operating manual shall not be part of this operating manual and shall be submitted separately.

In case of any revisions due to any reason, the same shall be incorporated and submitted as revised sheets during the start-up and commissioning stage along with updated CDs. However, revised operating manual incorporating changes shall be submitted within one month after the commissioning has been completed.

2.5.2. Pre-Commissioning and Commissioning Network

The CONTRACTOR shall submit the pre-commissioning and commissioning schedule in the form of network detailing therein the sequence of all the pre-commissioning and commissioning activities and duration of each activity to be carried out in each equipment / sub-system of the units. This shall be submitted to OWNER prior to start of pre-commissioning activities. CONTRACTOR shall submit weekly progress report and the status of pre-commissioning and commissioning activities; likely slippage and action being taken by the CONTRACTOR to contain these slippages.

2.5.3. Pre-Commissioning Documents

It shall be the responsibility of the CONTRACTOR to prepare detailed checklist of pre-commissioning and commissioning activities for Cooling Water System. The CONTRACTOR shall submit the said format for approval to the OWNER/ EIL.

Representative of CONTRACTOR shall be available for carrying out check listing. All the checklist points shall be liquidated by the CONTRACTOR. System readiness for Pre-commissioning shall be determined based on the completion of relevant portion of checklist as per approved format and all balance work completed by CONTRACTOR.

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For the purpose of execution of these pre-commissioning activities, the Cooling Water system shall be divided into system and sub-systems so that pre-commissioning activities of each system/ sub-system can be progressively carried out along with the construction activities. The pre-commissioning document shall contain the following as a minimum:

1) System identifications on P&IDs.

2) Pre-commissioning and start-up schedule

3) Detailed procedure for the various pre-commissioning activities i.e. flushing, blowing, drying, leak checking, system tightness, equipment operability test with format to record the observation of each of the activities to be carried out.

4) Procedure and format for operability tests of equipment and system as a whole, wherever applicable.

5) Lube schedule indicating manufacturer (Indian equivalent to lubes, quality, initial fill as recommended, and frequency of changing the lube oil).

6) Detailed procedure for pre-commissioning of Cooling Water System

7) Calibration certificate of all the instruments.

The CONTRACTOR shall submit the draft copy of above mentioned pre-commissioning documents 90 days before the activities are to be carried out. The document shall be reviewed by the OWNER/ EIL. After incorporating OWNER/ EIL's comments, the CONTRACTOR shall submit revised document 60 days prior to start of activities. The documents shall be followed till the project is completed.

CONTRACTOR shall arrange Manpower, instruments and tools required for carrying out pre-commissioning activities. Estimated requirement of raw water, power and plant air which needs to be supplied by OWNER during pre-commissioning and start-up is to be given by CONTRACTOR. After completion of pre-commissioning activities of the facilities CONTRACTOR will submit request to the OWNER for permission for start-up of the system.

Commissioning of the facilities shall not be permitted till all the documents have been submitted by the CONTRACTOR to the OWNER/ EIL. Any delay in commissioning on this account shall be considered as a delay in commissioning by the CONTRACTOR.

3.0. OTHER REQUIREMENTS

i) The Contractor shall also provide `No Smoking' boards & Do’s and Dont’s, boards for other designated instructions in unit areas.

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ii) Contractor shall also ensure implementation of all recommendations arising out of audits viz. internal pre-commissioning audit and audit by statutory bodies like PESO, OISD etc., as and when required.

iii) Before start up of unit, safety audit shall be conducted by Owner/PMC. All such check lists/ deficiency report generated by safety audit team shall be liquidated by the Contractor. The safety audit shall cover aspects such as floor opening, trip hazards, bump hazards, electrical safety concerns, mechanical safety concerns etc.

iv) Correct support, vibration and thermal expansion problems detected during commissioning.

4.0. HOUSE KEEPING

i) Provide continuous clean-up of the construction and operational area.

ii) Remove excess materials, temporary facilities and scaffolding and pick-up trash.

iii) Perform washing for further clean-up as required.

5.0. FINAL INSPECTION BEFORE START OF COMMISSIONING

i) OWNER/Contractor /PMC or any other Third party (Like OISD) shall carry out a final inspection of the UNIT before starting the commissioning activity.

ii) Record of liquidation of checklist point, test record etc shall be submitted by the Contractor to OWNER/PMC. Any deficiency/ changes required in the offered system shall to be liquidated by the Contractor.

iii) It shall be the Contractor's responsibility to repair any damage to the system occurred during storage, installation, pre-commissioning and commissioning stage.

6.0. UTILITIES REQUIREMENT

For commissioning, utilities required like plant air, cooling water, raw water, DM water, steam, instrument air, power to the extent of normal consumption during operation will be provided by BPCL.

For pre-commissioning Raw water, DM water, Steam, Instrument air will be provided by BPCL. Plant air has to be arranged by contractor.

Power shall be provided from new substation for pre-commissioning / commissioning activities.

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However, temporary piping/ fittings required to be done for drawing these utilities shall be in the scope of Contractor.

7.0. SAFETY

i) The Contractor shall follow OWNER's safety practices during execution of pre commissioning / commissioning works. Contractor is required to maintain and follow all safety practices equivalent or better than those being practiced by OWNER for the complex during pre-commissioning and commissioning.

ii) Necessary Hot/ cold work permit shall be obtained to carryout jobs once declared mechanically completed. (Refer OISD-STD-105, work Permit System).

8.0. SCOPE MATRIX

The Dark box in the First Column pertains to the activities to be performed by the Contractor to achieve mechanical Completion as per Contract. The activities indicated in the Second Column are also to be performed by the Contractor. However, the same shall not be reckoned for Mechanical Completion with regard to Contracts. For activities where dark box is placed in both first and second column, the activity needs to be completed by contractor to the extent possible for mechanical completion i.e. the reason for non-completion should not be attributable to the contractor

Work		Work Responsibility		
		CONTRACTOR		OWNER
		1	2	3
1.1	**Manufacturer OR Vendor Service Assistance where responsibility is not indicated in Section 2.**			
1.1.1	Obtain the assistance of the manufacturer or vendor, when necessary, to make a satisfactory installation as agreed on by the Contractor and the Owner	■	□	□
1.1.2	Obtain the assistance of the manufacturer or vendor, as required, for technical assistance during run-in by the Owner's operating and maintenance personnel, for training or for informational and operating purposes	□	■	□
1.1.3	Furnish names and telephone numbers including emergency contact of manufacturers, and vendors, technical service representatives for use by the Owner.	□	■	□
1.2	**Permits**			
1.2.1	Procuring all necessary permits and certifications required to be secured by the Owner for initial use of the plant.	■	□	□
1.2.2	Make applications for all necessary permits issued in the Owner's name that are required for plant use, occupancy and operation.	■	□	□
1.3	**Instructions**			
1.3.1	Maintain an adequate vendor instruction file so that information may be readily retrieved through plant commissioning.	■	□	□
1.3.2	Transmit to the Owner all applicable vendor's or manufacturer's instructions and drawings.	■	□	□
1.3.3	Provide the Owner with any special instructions such as the required procedures for drying liners	■	□	□
1.4	**Removal of Rust Preventives**			

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Work		Work Responsibility		
		CONTRACTOR		OWNER
		1	2	3
1.4.1	Remove all rust preventives and oils used to protect the equipment during the construction period whenever these protective materials will be detrimental to operation	■	□	□
1.4.2	Provide the Owner with a record of work completed.	■	□	□
1.5	**Lubricants**			
1.5.1	Provide a list of the manufacturer's recommended lubricants for use in the plant	■	□	□
1.5.2	Approve the lubricant list	□	□	■
1.5.3	Provide all lubricants	■	□	□
1.5.4	Flush systems and install initial charge of the lubricants. Dispose of all flushing oil in accordance with the Owner's instructions	■	□	□
1.5.5	Maintain Lubrication after initial charge	■	□	■
1.6	**Packing and Seals**			
1.6.1	Install mechanical seals and accessories, as required.	■	□	□
1.6.2	Install permanent packing and accessories as required.	■	□	□
1.6.3	Adjust and replace mechanical seals, packing and accessories as necessary during commissioning period.	□	■	□
1.7	**Removal of Temporary Bracing**			
1.7.1	Remove all temporary supports, bracing or other foreign objects that were installed in vessels, ducts piping, transformers, machinery or other equipment to prevent damage during shipping, storage and erection and repair any damage sustained.	■	□	□
1.8	**Rotation and Alignment**			
1.8.1	Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting the driver.	■	□	□
1.8.2	Perform cold alignment to the manufacturer's tolerances and record data.	■	□	□
1.8.3	Perform any doweling required.	■	□	□
1.8.4	Perform Hot alignment	□	■	□
1.8.5	Obtain the services of a factory representative to witness installation of equipment as required.	■	□	□
1.9	**Tie-Ins at Unit Limits**			
1.9.1	Prepare all systems for safe tie-ins	■	□	□
1.9.2	Obtain approval and make the necessary tie-ins at the unit limits, as required by the specifications and as directed by the Owner.	■	□	□
1.9.3	Remove blinds, car seals and so forth as required.	□	■	□
1.10	**Leak and Pressure Tests**			
1.10.1	Notify the Owner of the schedule for non-operating field leak tests or field pressure tests on piping and field fabricated equipment, unless otherwise directed by the Owner.	■	□	□
1.10.2	Provide any special media for test purposes.	■	□	□
1.10.3	Conduct all tests in accordance with applicable codes, specifications, regulations and the Owner's instructions.	■	□	□
1.10.4	Witness Tests.	■	■	■
1.10.5	Maintain records as required.	■	□	□
1.10.6	Dispose of all test media in accordance with the Owner's instructions.	■	□	□
1.10.7	Conduct all operational tightness tests.	□	■	□
1.10.8	Trial run of Fire Fighting system	□	■	□
1.10.9	Trial run of Gas Detection system	□	■	□
1.11	**Inspection**			
1.11.1	Provide inspection of the plant to verify that erected facilities	■	□	□

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Work	Work Responsibility		
	CONTRACTOR		OWNER
	1	2	3
conform to flow diagrams, construction drawings, vendor prints and specifications.			
1.11.2 Verify that specified materials have been installed in the plant and document verification to the extent required by the Owner.	■	□	■
1.11.3 Verify and approve the plant inspection. Note any exceptions on a separate work order list (punch list).	□	□	■
1.11.4 Provide for special inspections such as those required by insurance or governmental agencies.	■	□	□
1.11.5 Perform and report routine shop inspection.	■	□	□
1.11.6 Perform shop inspection and witness tests as desired.	■	□	□
1.11.7 Witness final shop inspections, as specified.	■	□	■
1.12 Pressure / Vacuum Safety Relief devices			
1.12.1 Provide the Owner with a list of proper pressure settings.	■	□	□
1.12.2 Transfer relief devices to and from the specified unit	■	□	□
1.12.3 Test and adjust all devices to and from the specified unit	■	□	□
1.12.4 Install all devices after testing, adjusting and tagging.	■	□	□
1.12.5 Maintain records as required.	■	□	□
1.13 Flushing and Chemical/Mechanical Cleaning.			
1.13.1 Conduct all flushing, blowing and chemical/mechanical cleaning operations where such operation can be accomplished without using permanently installed equipment., with details of flushing plans (by CONTRACTOR).	■	□	□
1.13.2 Conduct all flushing and blowing operations where permanently installed equipment must be used to obtainproper line velocities.	■	□	□
1.13.3 Provide any special media for flushing and blowing operations where permanently installed equipment must be used to obtain proper line velocities.	■	□	□
1.13.4 Dispose of all media in accordance with the Owner's instructions.	■	■	□
1.13.5 Turn systems over to the Owner free of trash and construction debris (not necessarily free of welding slag)	■	■	□
1.13.6 Maintain records, as required.	■	■	□
1.14 Temporary Screens, Strainers spools and Blinds.			
1.14.1 Provide and install all required temporary strainers.	■	■	□
1.14.2 Clean strainers, as required during circulation.	■	■	□
1.14.3 Remove strainers when system is adequately cleaned.	■	■	□
1.14.4 Provide install and remove all blinds, spools required for flushing and isolation.	■	■	□
1.14.5 Maintain records as required.	■	■	□
1.15 Purging/Inerting			
1.15.1 Install purge/inerting connections.	■	□	□
1.15.2 Provide purge materials and conduct necessary purge operations.	■	■	□
1.15.3 Provide inerting materials and introduce where specified.	■	■	□
1.16 Vessel Packing and Fixed Beds			
1.16.1 Install all inert materials such as sand, gravel balls rings and saddles.	■	□	□
1.16.2 Install all materials other than the materials specifically noted in Section 2, such as chemicals, resins, desiccants and catalysts.	■	■	□
1.16.3 Install all mixed beds involving combinations of material, covered by 1 and 2 above.	■	■	□
Work	Work Responsibility		
	CONTRACTOR		OWNER
	1	2	3

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Work	Work Responsibility		
	CONTRACTOR		OWNER
	1	2	3
1.16.4 Inspect the vessel interior before and during loading to ensure proper installation.	■	■	□
1.16.5 Maintain records, as required.	■	■	□
1.17 House-Keeping			
1.17.1 After completion of construction, remove excess material, temporary facilities and scaffolding, rough sweep or rake the area and pick up trash, perform washing or further cleanup, as required.	■	□	□
1.17.2 After completion of construction, maintain adequate housekeeping practices, as required for safe operation.	■	□	□
1.18 Maintenance, Spare Parts and Special tools			
1.18.1 After pre-commissioning is complete, protect equipment from normal weather conditions, corrosion or damage	□	■	□
1.18.2 After pre-commissioning is complete provide adequate maintenance for equipment including the cleaning of strainers and the repairing of steam traps.	■	□	□
1.18.3 Provide the Owner with spare parts list as recommended by the manufacturers.	■	□	□
1.18.4 After pre-commissioning is complete, maintain adequate spare parts and supplies required during commissioning & performance test run.	□	■	□
1.19 Noise Survey			
1.19.1 Conduct individual equipment noise surveys, as required by the Occupational Safety & Health administration on the Owner's specifications.	■	■	□
1.19.2 Document all survey data	■	■	□
2.1 Vessels			
2.1.1 Open the vessel after erection and put in place any internals requiring field installation. These internals will be inspected before and after installation	■	□	□
2.1.2 Open both internal and external manways for inspection of the vessel by the Owner, unless otherwise specified.	■	□	■
2.1.3 Witness inspections to the extent desired.	□	□	
2.1.4 Dry out if required, upon vessel and install materials that are designated in 1.16	■	□	□
2.1.5 Close after proper execution of closure permits.	■	□	□
2.5 Pumps and Drivers			
2.5.1 Level base plates and sole plates and grout all bearing Surfaces.	■	□	□
2.5.2 Alleviate any excess piping stresses that may be imposed on pumps, compressors and drivers.	■	□	□
2.5.3 Chemically clean any completed lube and seal oil system when specified. Dispose of wastes and cleaning media in accordance with the Owner's instructions.	■	□	□
2.5.4 Charge the lube oil, seal oil and oil cooling systems with flushing oil and circulate for cleaning purpose. Dispose of any flushing oil in accordance with Owner's instructions.	■	□	□
2.5.5 Charge the lube oil, seal oil and oil cooling systems with the operating oil recommended by the manufacturer.	■	□	□
2.5.6 Operate equipment and make vibration trip governor and safety device checks and any operating tests and adjustments as required.	■	■	□
2.5.7 Obtain the assistance of service engineer for technical advice during installation or start up if desired.	■	■	□

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2.5.8	Maintain records as required.	■	□	□
2.6	**Tanks**			
2.6.1	After erection and installation, install any internals, which require field installation.	■	□	□
2.6.2	Test tank and internals as required. Dispose of test water in accordance with the Owner's instructions.	■	□	□
2.6.3	Conduct chemical cleaning or flushing operations as required. Dispose of wastes and cleaning media in accordance with the Owner's instructions.	■	■	□
2.6.4	Witness test and inspections to the extent desired.	□	□	■
2.6.5	Close after proper execution of closure permits.	■	□	□
2.7	**Piping System**			
2.7.1	Notify the Owner of test schedule.	■	□	□
2.7.2	Hydrotestically or pneumatically test all piping as required by codes, specifications and the Owner's instructions.	■	□	□
2.7.3	Witness field pressure tests, when notified.	□	□	■
2.7.4	Flush and drain system and install orifice plates. Orifice plates shall not be installed before hydrostatic testing. (see 2.9 for the removal or isolation of other inline components).	■	□	□
2.7.5	Drain system, remove blinds and perform tightness tests as required.	□	■	□
2.7.6	Insulate or, piping system, paint flanges, threaded joints or field welds after the specified testing of each system a has been completed. Unless instructed otherwise by Owner.	■	■	□
2.7.7	All welded joints (longitudinal, girth and nozzle) in underground piping that have not been shop tested shall be left exposed (free of paint, dope and wrap) until the specified testing has been completed. After final testing of these joints cover the system.	■	□	□
2.7.8	Check pipe-hangers, supports, guides, expansion joints and other pipe specialties for the removal of all shipping and erection stops and for the correctness of cold settings for the design service. Also provide the Owner with instructions for hot settings.	■	□	□
2.7.9	Check pipe-hangers, supports guides and pipe specialties for hot settings and make minor adjustments as necessary.		■	□
2.7.10	Install permanent filter elements as required.		■	□
2.7.11	Verify, to the extent required by the Owner that specified valve packing has been provided in valves installed in the plant.	■	□	□
2.7.12	Install car seals on valves whether necessary.	□	■	□
2.7.13	Check and record the positions of all car sealed valves paint of identify valves as required.	□	■	□
2.7.14	Correct support, vibration and thermal expansion problems detected during commissioning.		■	□
2.7.15	Re-torque all hot and cold service bolting during commissioning and startup as required.		■	□
2.8	Electrical Power and Lighting Systems			
2.8.1	Notify the Owner of the test schedule.	■	■	□
2.8.2	Witness tests when notified and record test data as required.	□	□	■
2.8.3	Using a megohmmeter, make insulation tests on all wing except lighting wiring.	■	□	□

Work	Work Responsibility		
	CONTRACTOR		OWNER
	1	2	3

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2.8.4 Using a megohmmeter, make insulation tests on motor and transformer winding from phase to phase and phase go ground.	■	□	□
2.8.5 Make grounding system tests to determine the continuity of connections and the value of resistance to ground.	■	□	□
2.8.6 Arrange for breakdown tests on oil sample from oil insulated transformers larger than 100 kilovolts absolute.	■	□	□
2.8.7 Charge electrical gear with oil and / or other media as required.	■	□	□
2.8.8 Perform trails and adjustments on all switchgear, motor control equipments and generators.	■	■	□
2.8.9 Test and set switchgear and circuit breaker relays for proper coordination.	□	■	□
2.8.10 Obtain local inspector's approval, where required.	■	■	□
2.8.11 Energize all substations with approval of the Owner after completion of all tests.	■	■	□
2.8.12 Check phase sequence polanty and motor rotation.	■	■	□
2.8.13 Check installation of emergency power and lighting systems.	■	■	□
2.8.14 Provide the Owner with a record of work complete.	■	■	□
2.9 Instrument System			
2.9.1 Conduct any non-operating checks to ensure instrument operability, that is remove all shipping stops, check pointer travels and verify instrument capability to measure operate and stroke in the direction and manner required by the process application.	■	■	□
2.9.2 As dictated by the Owner's practice, bench or field calibrate instruments with standard test equipments and make all required adjustments and control point settings.	■	□	□
2.9.3 Clean all transmission and control tuning by blowing with cooled and filtered clean air before connecting to instrument components.	□	■	□
2.9.4 Clean all air-supply headers by blowing with clean air and check them for tightness.	□	■	□
2.9.5 Leak test pneumatic control circuits in accordance with clean the latest edition of ISA Recommended Practice 7.1. Pneumatic control circuit pressure test.	■	■	□
2.9.6 Install and connect all system components and verify their conformance to specification and design criteria for function and range suing dummy transmission signals as need.	□	■	□
2.9.7 Check all electrical signals and alarm wiring for continuity, correct source of power and polarity.	□	■	□
2.9.8 Check thermocouples for proper joining of wires, position of elements in wells proper polarity and continuity of receiving instruments.	□	■	□
2.9.9 Identify orifice plates by tagging.	■	■	□
2.9.10 Check and record bores or orifice plates and install after completion of flushing operations.	□	■	□
2.9.11 Isolate or remove, if necessary, in line components such as control valves, positive displacement meters and turbine meters for pressure testing. Reinstall these items after testing the system with the components removed or isolated	■	■	□
2.9.12 Isolate or remove components for flushing operations and reinstall them on the completion of these operations.	■	■	□
2.9.13 Install any sealing fluids as required.	□	■	□
Work	**Work Responsibility**		
	CONTRACTOR		**OWNER**
	1	2	3

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2.9.14 Fully pressurize and energize the transmitting and control signal system(s) by opening process connections at primary sensors and final regulations and by making control mode settings for automatic operation of equipment as the process unit is charged and brought on stream.	□	■	□
2.9.15 Provide a schedule of recorder charts.	■	■	□
2.9.16 Checking piping from instruments to process piping for tightness'	■	■	□
2.10 Boilers/Heaters			
2.10.1 Make a non-operating boiler pressure test in accordance with applicable codes, specifications and the Owner's instructions, if required.	■	□	□
2.10.2 Inspect the boiler for completeness and correctness of installation and make other non-operating preferring checks.	■	□	□
2.10.3 Check operation of air pre-heaters, dampers soot blowers and other equipment for proper positioning and travel.	■	■	□
2.10.4 Dry refractories during initial firing by following the manufacturer's temperature cycles.	■	■	□
2.10.5 Purge, flush and drain steam mains as necessary.	■	■	□
2.10.6 Obtain and charge treated water of bailout and initial operation as required.	□	■	□
2.10.7 Commission auxiliaries as detailed elsewhere under the appropriate equipment type.	□	■	□
2.10.8 Conduct Boilout, chemical cleaning, and flushing operations, as required .Dispose of wastes, cleaning media, in accordance with Owners, instruction	■	□	□
2.10.9 Conduct initial lightoff, making associated checks and adjustments	□	■	□
2.10.10 Obtain the assistance of service engineer for technical advice during installation of start up if desired.	▮	▮	□
2.10.11 Conduct all operating tests and obtain the required certifications.	□	▮	▮
2.10.12 Check and set pressure relief valves.	□	▮	□
2.11 Miscellaneous Equipment (Agitators, Mixers, Rotary Filters, Weigh Scales and Materials Handling Equipments).			
2.11.1 Fully assemble rotary filters except for final filter media (cloth, precoat or screen).	▮	□	□
2.11.2 Install all final filter media.	□	▮	□
2.11.3 Level and calibrate weigh scales with the assistance of the manufacturer's representation and set tare weights wherever possible.	▮	□	□
2.11.4 Manually check materials handling equipment for freedom and direction of movement.	▮	□	□
2.11.5 Check clearance on materials handling equipment as directed by the Owner.	□	▮	□
2.11.6 Make all final adjustments during run in and conduct any required performance test.	□	▮	□
2.11.7 Obtain a service engineer for technical assistance during installation of startup, if required.	▮	▮	□
2.11.8 As required obtain certification that all lifting and materials handling installations and other items of equipment comply with government regulations.	▮	▮	□

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ANNEXURE-I

FORMAT TO BE USED DURING PRE-COMMISSIONING AND COMMISSIONING

(TOTAL 5 FORMATS)

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F O R M A T - I

INTIMATION REGARDING SYSTEM COMPLETION

PROJECT:_____ CUSTOMER:_____
UNIT:_____

Following system/sub-system has been mechanically completed in all respects with exceptions noted below. The system/sub-system can be taken up for checking and preparation of checklist.

SYSTEM/SUBSYSTEM NO.

SYSTEM/ SUB-SYSTEM DESCRIPTION:

EXCEPTIONS:

SIGNATURE DATE

CONTRACTOR 'S
CONSTRUCTION :
CO-ORDINATOR

The system is ready/ not ready for Check listing

OWNER:

PMC:

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F O R M A T - II

CHECKLIST

PROJECT:_____CUSTOMER:_____UNIT:___

SYSTEM/SUB-SYSTEM_____
_____

CHECKLIST TYPE **PRELIMINARY/FINAL**

SL.NO.	CHECKLIST ITEMS	REMARKS

SIGNATURE DATE

PMC :

OWNER:

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F O R M A T - III

READY FOR PRE-COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____
UNIT:_____

This is to certify that the following Plant/system/sub- system as detailed below is completely installed and all the Checklist points are carried out except for minor details as given in the attached list.

SYSTEM/SUB-SYSTEM No. _____

DESCRIPTION OF SYSTEM/ SUB-SYSTEM: _____

SIGNATURE DATE

CONTRACTOR 'S CONSTRUCTION CO-ORDINATOR:

CONTRACTOR 'S COMMISSIONING CO-ORDINATOR

The system is ready/ not ready for pre-commissioning

PMC :

OWNER:

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F O R M A T - IV

READY FOR COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____
UNIT:_____

This is to certify that all the necessary pre-commissioning activities for the system/sub-system as detailed below have been completed and the system/sub-system is ready for commissioning except for the minor details as given below which will not affect the commissioning trial runs.

SYSTEM/SUB-SYSTEM No. : _____

DESCRIPTION OF SYSTEM/ SUB-SYSTEM : _____

SIGNATURE DATE

CONTRACTOR 'S COMMISSIONING:
CO-ORDINATOR

SIGNATURE DATE

PMC:

OWNER:

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F O R M A T - V

COMPLETION OF COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____ UNIT:_____

This is to certify that the system/ sub-system as detailed below has been successfully commissioned and is under operational control of Client's Production department.

SYSTEM/ SUB-SYSTEM_____

DESCRIPTION OF SYSTEM/SUB-SYSTEM: _____

SIGNATURE DATE

CONTRACTOR 'S COMMISSIONING:
CO-ORDINATOR

SIGNATURE DATE

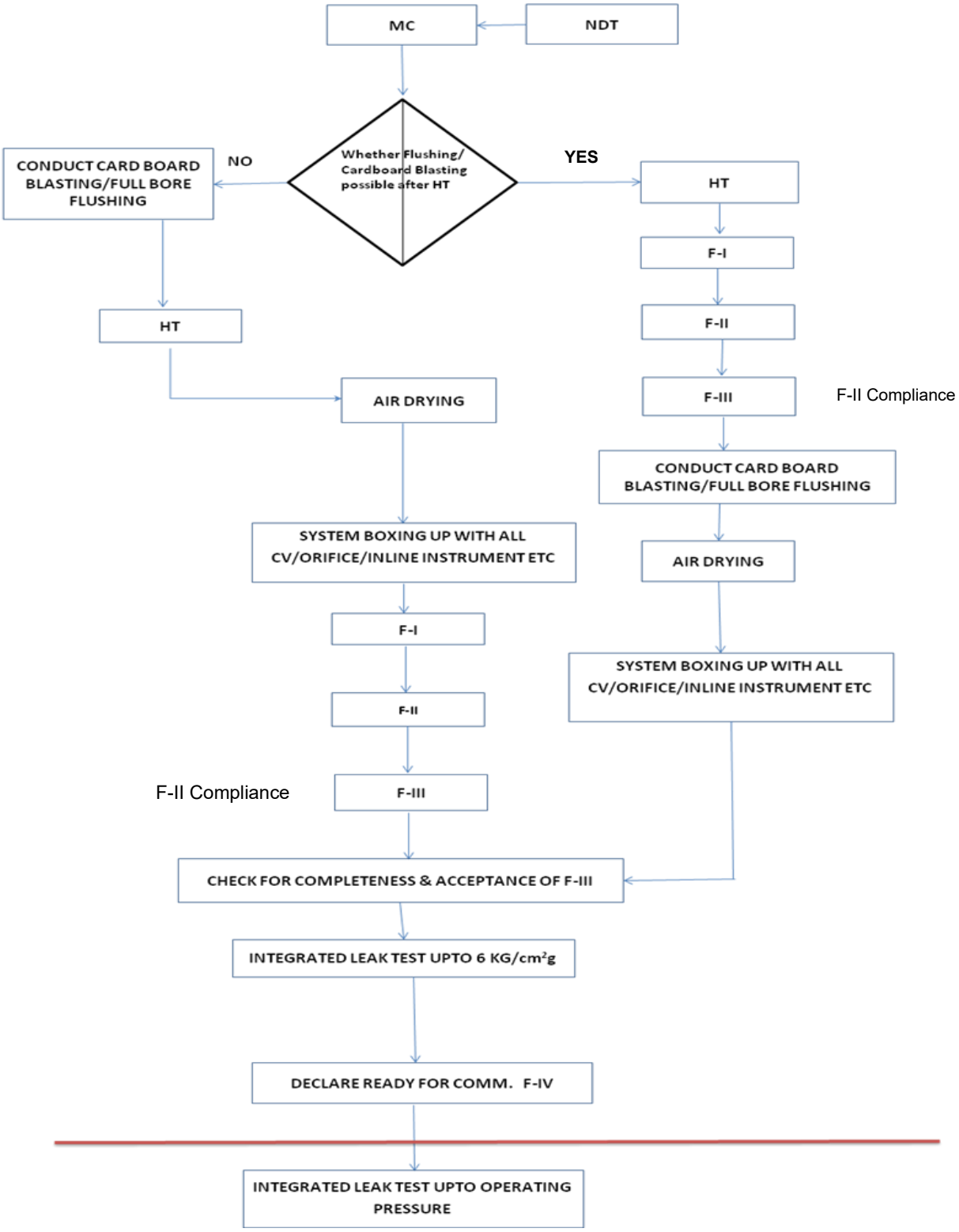
PMC:

OWNER:

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ANNEXURE-II

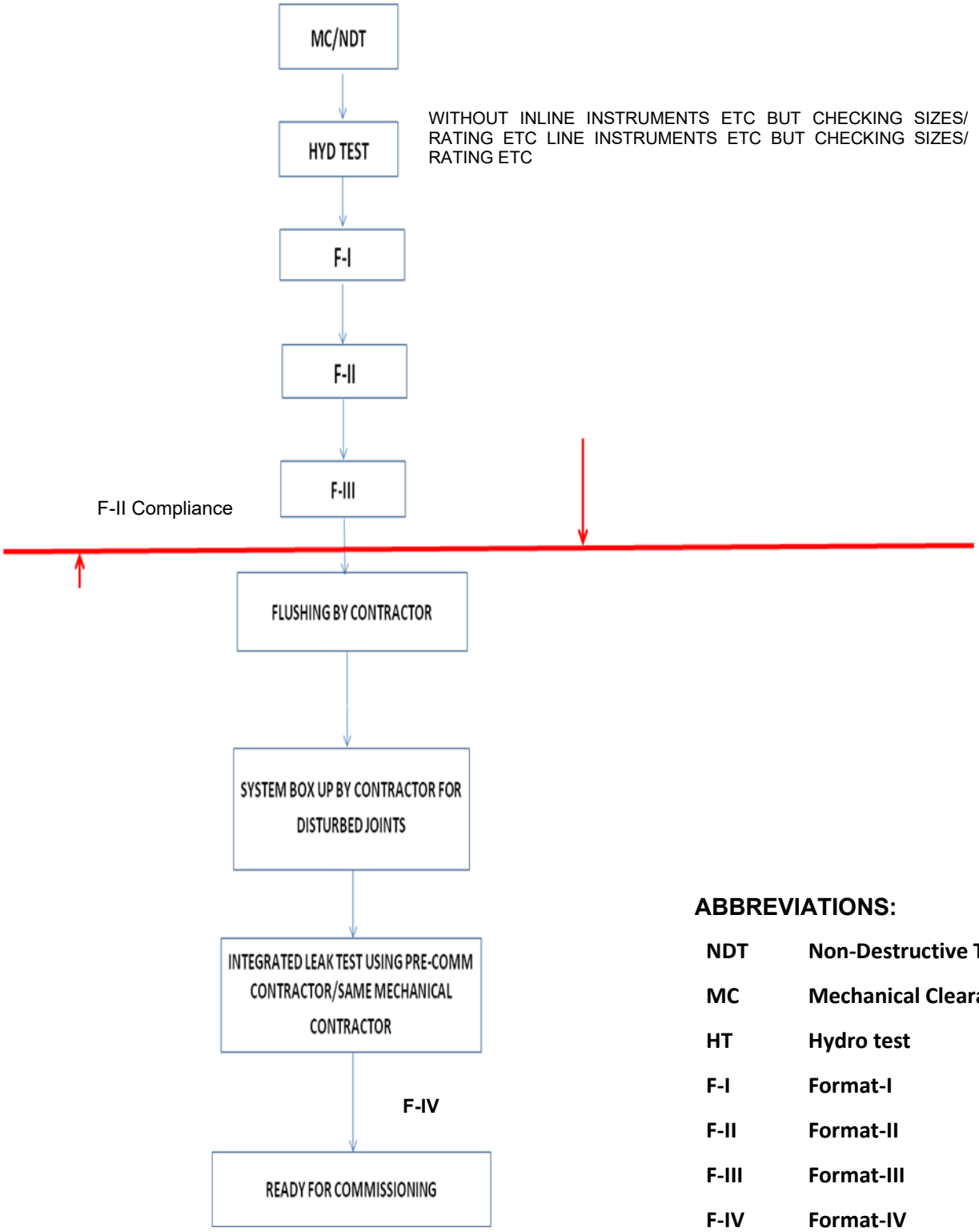
PRE-COMMISSIONING ACTIVITIES NEED TO BE COMPLETED FOR DECLARING MECHANICAL COMPLETION WITHIN CONTRACTOR STIPULATED TIME FOR PROCESS SYSTEMS IN UNITS



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ANNEXURE-III

PRE-COMMISSIONING ACTIVITIES NEED TO BE COMPLETED FOR DECLARING MECHANICAL COMPLETION WITHIN CONTRACTUAL STIPULATED TIME FOR UTILITY SYSTEM IN UNITS



ABBREVIATIONS:

NDT	Non-Destructive Testing
MC	Mechanical Clearance
HT	Hydro test
F-I	Format-I
F-II	Format-II
F-III	Format-III
F-IV	Format-IV

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SCOPE OF WORK AND SUPPLY
(ARCHITECTURAL)

COMPOSITE WORKS UTILITIES & OFFSITES (PART A & B)

B957-999-69-41-PK-T-9501

PROJECT : **BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP), MADHYA PRADESH**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED (BPCL)**

PMC : **ENGINEERS INDIA LIMITED**

JOB NO. : **B957**

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
A	17.03.2026	ISSUED FOR TENDER	PC	PD	AG

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CONTENTS

1.0 SCOPE OF WORK
1.1 BROAD SCOPE OF WORK
1.2 DETAIL SCOPE OF WORK
2.0 SCOPE OF SUPPLY
2.1 OWNER'S SCOPE OF SUPPLY
2.2 CONTRACTOR'S SCOPE OF SUPPLY
3.0 LIST OF ATTACHMENTS
3.1 SPECIFICATIONS
3.2 STANDARDS
3.3 DRAWINGS
3.4 SCHEDULE OF RATES
4.0 PREAMBLE TO SCHEDULE OF QUANTITIES

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1.0 SCOPE OF WORK

1.1 Broad scope of work

The broad scope of work of the Contractor shall be execution of Architectural works for Buildings or Sheds or Structures as mentioned in accordance with detail scope of work, construction drawings, standards, specifications, schedule of quantities/ rates, contract provisions and as directed by Engineer-In- Charge including:

- Supply and provision of materials, labour, tools, tackles etc.
- Preparation and submission of fabrication or installation or execution drawings.
- Assistance for obtaining approvals from statutory or other Authorities.
- Co-ordination with other Contractors and agencies, Owner, Project Management Consultant (PMC) etc.
- Preparation and submission of "As-built" drawings.
- Any other incidental works not specifically mentioned but required for completion of the work.

1.2 Detail scope of work

1.2.1 Buildings or Sheds or Structures

Scope of work of the Contractor shall include (but not limited to) the following Buildings or Sheds or Structures.

Sl.no	Building	Structure type	Nos
1.	Barricading work		
2.	Compressor Shed 02	The building shall be structural steel shed with Precoated Galvalume/ Zincalume sheet roofing and cladding.	1
3.	Compressor Shed 03	The building shall be structural steel shed with Precoated Galvalume/ Zincalume sheet roofing and cladding.	1

1.2.2 Architectural works

Architectural works in the scope of work of Contractor shall include Architectural elements and finishes such as (but not limited to) Floor finishing, Wood work, Doors & Windows, Plastering, Pointing, Painting, Polishing, Roofing (roof sheeting, flashings, rain water drainage etc.), Waterproofing, Sanitary fittings & fixtures, Insulation, Partition, False ceiling, False flooring, External façade system, External & internal claddings etc. as applicable.

1.2.3 Supply and provision of materials, labour, tools, tackles etc.

Unless otherwise specifically mentioned, supply and provision (including transportation, storage, fabrication, installation and execution etc.) of all materials (consumables and non-consumables), labour, tools, tackles, equipment, plant machinery, staging, scaffolding, HSE (Health, safety, environment) gear etc as required for completion of work is included in the scope of work of the Contractor.

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1.2.4 Preparation and submission of fabrication or installation or execution drawings

Preparation and submission of fabrication or installation or execution drawings of Façade system, Cladding system, False flooring, False ceiling, Partitions etc. as applicable is included in the scope of work of the Contractor. Installation or execution of the works shall be in accordance with approved drawings.

1.2.5 Assistance for obtaining approvals from statutory or other Authorities

Contractor shall assist the Owner or PMC or Engineer-In-Charge and do necessary liaison activities as required for obtaining approvals from statutory or other Authorities.

1.2.6 Co-ordination

Contractor shall do all required co-ordination activities with other Contractors and agencies, Owner, Project Management Consultant (PMC) etc for smooth, sequential and complete execution works.

1.2.7 Preparation and submission of “As-built” drawings

Contractor shall prepare “As-built” mark-up prints on construction drawings and subsequently update the same in soft copy (Auto CAD) of the drawings. Contractor shall submit hard copy and soft copy to Engineer-in-charge as specified elsewhere in this Bid package.

1.2.8 Incidental works

Any other incidental works such as cleaning, cutting chases or holes, making good of the damaged works, protection of works, handing over the works in acceptable condition, which are not specifically mentioned but required for completion of work are also included in the scope of work of Contractor.

2.0 SCOPE OF SUPPLY

2.1 Owner’s scope of supply

- Nil

2.2 Contractor’s scope of supply

- Refer clause 1.2.3 above

3.0 LIST OF ATTACHMENTS

3.1 SPECIFICATIONS

S. No.	Specification No.	Rev.	Title
1	6-75-0001	7	Specification for Architectural Works - General.
2	6-75-0002	7	Specification for floor finishing
3	6-75-0004	8	Specification for Steel/ Aluminium doors, windows & ventilators

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4	6-75-0005	7	Specification for plastering & pointing.
5	6-75-0007	7	Specification for whitewashing, Colour washing, distempering, Painting & polishing.
8	6-75-0008	7	Specification for roofing.
12	6-75-0014	0	Standard specification for pre-engineered building (architectural)

3.2 STANDARDS

S. No.	Title	Standard No.	Rev. No.
1.	Skirting detail (with brick wall).	7-75-0002	6
2.	Skirting detail (with R.C.C. column).	7-75-0003	6
3.	Glazed Aluminium Door	7-75-0014	6
4.	Glazed Aluminium Window	7-75-0015	6
5.	Steel gate (for entrances upto 6.0m width)	7-75-0054	6
6.	Plinth protection (with building drain)	7-75-0065	6
7.	Steel Door (Pressed Steel) Single Shutter	7-75-0070	6
8.	Steel Door (Pressed Steel) Double Shutter	7-75-0071	6
9.	Metal sheet (flashing detail)	7-75-0091	2
10.	Stainless steel tubular handrail	7-75-0093	2
11.	Ramp detail (for wheel chair users)	7-75-0097	1

3.4 SCHEDULE OF RATES/ QUANTITIES

For schedule of rates of Architectural works refer Document Number B957-999-81-46-PK-SOR -9501

4.0 PREAMBLE TO SCHEDULE OF QUANTITIES

4.1 Rate quoted by the Contractor for the items shall be inclusive of all materials, labour, tools, tackles etc. and other scope or works elaborated in this document and tender/ contract document and shall be applicable for all heights and locations.

4.2 Works shall be executed in accordance with Item description, corresponding specification, standards, drawings and as directed by Engineer-In-Charge. Specification No. 6-75-0001 shall be applicable to all the items with reference to aspects like contradictions amongst items/specifications, and drawings, quality of material, mode of measurement, necessary testing etc.

For CPWD or DSR or local PWD items, corresponding specification shall be referred.

4.3 Items/sub-items against which no quantity is given shall not be quoted by the Contractor and shall not be executed. Such items if any are for reference purpose only.

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4.4 Quantities of the items are not final and may vary; actual quantities executed shall be paid.

4.5 All the items included in the schedule of quantities may not be executed.

4.6 Materials shall conform to items, specifications, standards and shall be as approved by Owner or PMC or Engineer-In-Charge. Materials shall be procured from approved Manufacturer or vendor, list of which is included in the Tender or contract document.

4.6.1 Only 'first' quality materials shall be used.

4.6.2 Owner/ PMC reserve the right to choose any of the approved make/ vendors as per the vendor or Manufacturer's list.

4.6.3 In case of products not indicated in the vendor list, BIS marked products shall be used.

4.6.4 Specification of manufacturer's item shall be checked against tender items and specifications before selecting any product or brand name. In case of any discrepancy, tender item/ specifications shall prevail, and any such brand of item shall not be used which is not conforming to tender specifications even if it is listed in this vendor list.

4.6.5 In case of non-availability of any material among approved vendors/ makes in a particular site or region, alternate vendor/ make conforming to national or international codes shall be used subject to approval by owner/ PMC.

4.6.6 In case of non-availability of any vendor among approved vendors in a particular site/ region, alternate vendor's name shall be proposed along with required credentials for EIL's approval.

4.6.7 In case of any product neither covered in the vendor list nor having specifications, the contractor shall submit the proposed product along with technical literature/ specifications (as/ bid), test certificates etc. and other credentials of the manufacturer for Owner/ PMC approval

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DESIGN BASIS FOR WIND LOAD ON PIPING

(Engineering & Technology Development)

PROJECT : BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP), BINA

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

CONSULTANT : Engineers India Ltd.

JOB NO. : B857

1. SCOPE

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
1	30.04.2025	Basic wind Speed is updated	VBA	PG	SVRS
0	19.11.2024	ISSUED AS GUIDE	VBA	PG	SVRS

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The scope of this document is to specify the wind pressure to be considered for calculation of wind load on piping systems. The effect of wind on a piping system is to produce a set of vibratory/dynamic loads acting along different directions depending on the configuration of the piping. However, the design wind load for a piping system is often calculated on the basis of a statically applied maximum pressure(s) that can be expected over the design life of the plant/unit.

2. GENERAL NOTES

The wind load analysis shall be done for the following piping systems.

(i) Two Phase Flow Lines.
(ii) Flare Header.
(iii) Any other line of size 20" (O.D.) & above (including insulation, if any) running above 10-meter height from HPP level.

However, all lines should have a sufficient number of horizontal restraints/guides to resist the design wind load to be calculated as per the formula indicated in section 3 of this document. Additional horizontal supports may be required to reduce excessive horizontal deflection of pipe due to wind load.

3. DESIGN WIND LOAD

The design wind load on a pipe shall be calculated from the following relation:

$$F_{wz} = C_f \; p_d D_o$$

Where F_{wz} = Wind load at height z **per unit length of pipe**
C_f = Shape factor (to be considered as 0.7)
D_o = External diameter of pipe including the insulation
p_d = $K_d * K_a * K_c * p_z$, Design wind pressure on pipe at height z
p_z = Wind pressure on pipe at height z

Height (in 'm') of pipe above ground	≤ 10	15	20	30	50	100
Design wind pressure p_d (in 'N/m^2')	1265	1438	1559	1717	1917	2200

Notes:

(i) Above wind pressures are based on k_1 value corresponding to Basic Wind Speed of 47 m/s and Design Life of 100 years, k_2 value corresponding to Category 3, k_3 (topography factor) value to be 1.0 and k_4 (importance factor for the cyclonic region) value to be 1.0 respectively as defined in IS 875 (Part 3) 2015 amendment no.2.

(ii) K_d (Wind directionality factor) value to be 1.0, K_a (Area averaging factor) value to be 1.0 and K_c (Combination factor) value to be 1.0 respectively as defined in IS 875.

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(iii) Wind pressure for any intermediate height may be linearly interpolated.

4. LOAD COMBINATIONS

All supports should be adequate for the following load combinations due to wind load alone in addition to other load conditions considered for the design of piping:

(i) Sustained load + Wind Load

(ii) Sustained load + Thermal load (operating) + Wind Load

However, the stress in the piping should be checked only for the first load case (i.e., Sustained load + Wind Load) and the maximum stress in the pipe should be limited to 1.33 times the allowable stress at the maximum operating temperature.

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SITE SPECIFIC SEISMIC SPECTRA

(Engineering & Technology Development)

PROJECT : **BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP), BINA**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED**

CONSULTANT : **Engineers India Ltd.**

JOB NO. : **B857**

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	11.11.2024	ISSUED FOR IMPLEMENTATION	MBA	GGSA	SVRS

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SITE SPECIFIC SEISMIC SPECTRA

Site specific seismic spectrum is generated in accordance with Section 7 of IS 1893 (Part 4): 2024 for 10% probability of exceedance in 50 years for different damping values. The design horizontal seismic coefficient shall be estimated in accordance with Clause no. 7.3.1 of IS 1893 (Part 4) using spectral acceleration coefficient presented below. All other seismic parameters shall be as per IS 1893.

Spectral Acceleration Coefficients (S_a/g) for 10% probability of exceedance in 50 years:

Spectral Acceleration Coefficients (Sa/g) for 5% damping for 10% probability of exceedance in 50 years in the horizontal direction shall be based on the following equation. The spectral acceleration values for different damping ratio are presented in Figure 1 and Table 1.

S_a/g (damping: 5%)	= 0.052	for 0.00<T≤0.01 sec
	= 0.043+0.867T	for 0.01<T≤0.10 sec
	= 0.13	for 0.10<T≤0.40 sec
	$= \frac{0.052}{T}$	for 0.40<T≤6.00 sec
	$= \frac{0.312}{T^2}$	for 6.00<T≤10.0 sec

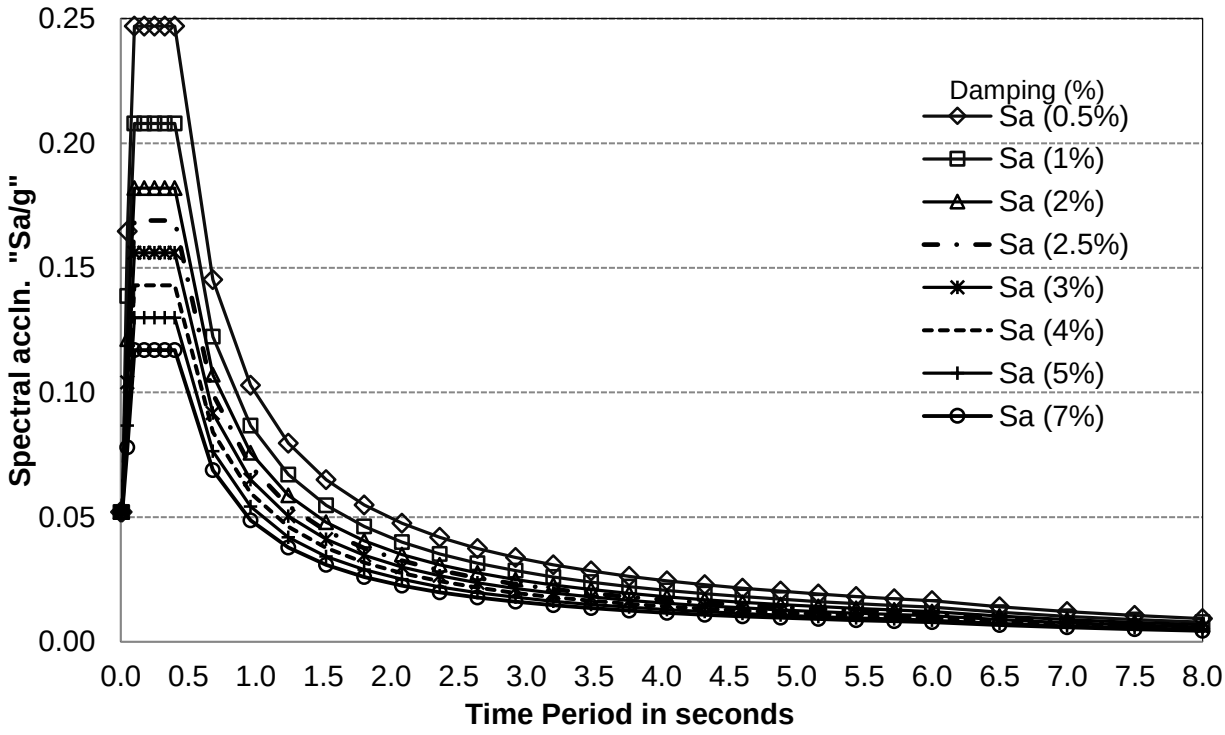


Figure 1: Site specific seismic spectra for 10% probability of exceedance in 50 years

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Table 1: Spectral Acceleration Coefficients (S_a/g) for 10% probability of exceedance in 50 years

Time Period (sec)	Percentage of critical damping							
	0.5	1.0	2.0	2.5	3.0	4.0	5.0	7.0
0.000	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
0.010	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
0.050	0.165	0.139	0.121	0.113	0.104	0.095	0.087	0.078
0.100	0.247	0.208	0.182	0.169	0.156	0.143	0.130	0.117
0.175	0.247	0.208	0.182	0.169	0.156	0.143	0.130	0.117
0.250	0.247	0.208	0.182	0.169	0.156	0.143	0.130	0.117
0.325	0.247	0.208	0.182	0.169	0.156	0.143	0.130	0.117
0.400	0.247	0.208	0.182	0.169	0.156	0.143	0.130	0.117
0.680	0.145	0.122	0.107	0.099	0.092	0.084	0.076	0.069
0.960	0.103	0.087	0.076	0.070	0.065	0.060	0.054	0.049
1.240	0.080	0.067	0.059	0.055	0.050	0.046	0.042	0.038
1.520	0.065	0.055	0.048	0.044	0.041	0.038	0.034	0.031
1.800	0.055	0.046	0.040	0.038	0.035	0.032	0.029	0.026
2.080	0.048	0.040	0.035	0.033	0.030	0.028	0.025	0.023
2.360	0.042	0.035	0.031	0.029	0.026	0.024	0.022	0.020
2.640	0.037	0.032	0.028	0.026	0.024	0.022	0.020	0.018
2.920	0.034	0.028	0.025	0.023	0.021	0.020	0.018	0.016
3.200	0.031	0.026	0.023	0.021	0.020	0.018	0.016	0.015
3.480	0.028	0.024	0.021	0.019	0.018	0.016	0.015	0.013
3.760	0.026	0.022	0.019	0.018	0.017	0.015	0.014	0.012
4.040	0.024	0.021	0.018	0.017	0.015	0.014	0.013	0.012
4.320	0.023	0.019	0.017	0.016	0.014	0.013	0.012	0.011
4.600	0.021	0.018	0.016	0.015	0.014	0.012	0.011	0.010
4.880	0.020	0.017	0.015	0.014	0.013	0.012	0.011	0.010
5.160	0.019	0.016	0.014	0.013	0.012	0.011	0.010	0.009
5.440	0.018	0.015	0.013	0.012	0.011	0.011	0.010	0.009
5.720	0.017	0.015	0.013	0.012	0.011	0.010	0.009	0.008
6.000	0.016	0.014	0.012	0.011	0.010	0.010	0.009	0.008
6.500	0.014	0.012	0.010	0.010	0.009	0.008	0.007	0.007
7.000	0.012	0.010	0.009	0.008	0.008	0.007	0.006	0.006
7.500	0.011	0.009	0.008	0.007	0.007	0.006	0.006	0.005
8.000	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.004
8.500	0.008	0.007	0.006	0.006	0.005	0.005	0.004	0.004
9.000	0.007	0.006	0.005	0.005	0.005	0.004	0.004	0.003
9.500	0.007	0.006	0.005	0.004	0.004	0.004	0.003	0.003
10.000	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003

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NOTES:

1. For methodology of calculation of seismic forces and other seismic design criteria, refer latest revisions of the following codes:

   IS 1893 (Part 1): 2016 General provisions and buildings

   IS 1893 (Part 4): 2024 Industrial structures including stack-like structures

2. Seismic design of liquid storage tanks shall be in accordance with IS 1893 (Part 2). For tanks not covered under IS 1893 (Part 2), shall be designed with relevant international standards as specified in project specifications (such as API650/620, Eurocodes, etc).
3. When cylindrical storage tanks are designed as per API 650/620 or another relevant standard using site-specific design methods, the percentage of critical damping and response reduction shall be taken in accordance with the respective design codes. For these tanks, importance factor and category shall be as per IS 1893 (Part 4).

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SEISMIC DESIGN REQUIREMENTS FOR PIPING

(Engineering & Technology Development)

PROJECT : **BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP), BINA**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED**

CONSULTANT : **Engineers India Ltd.**

JOB NO. : **B857**

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	19.11.2024	ISSUED AS GUIDE	VBA	PG	SVRS

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1. SCOPE

This document provides certain guidelines/methods to be used for seismic analysis of the piping. However, detailed mathematical formulations for seismic analysis are outside its scope.

2. DESIGN ACCELERATION DUE TO EARTHQUAKE

The spectral acceleration coefficients (S_a/g) shall be obtained from the site-specific seismic spectra document no. B857-000-16-54-DB-0001. The horizontal seismic acceleration coefficients (A_h) shall be calculated as per section 7.3.1 of IS 1893, Part 4: 2024. I/R ratio (Importance factor to response reduction factor) shall be considered as 0.75 for process piping while for utility piping it shall be 0.6. Vertical acceleration values may be taken as 2/3rd of the corresponding horizontal values.

3. METHOD OF SEISMIC DESIGN

3.1 METHOD OF ANALYSIS

Response Spectrum Method shall be used for seismic analysis of piping. The piping that requires seismic analysis has to be designed for multi-component earthquakes (i.e., two horizontal directions and the vertical direction) as per the procedure given in section 8.3.2.1 of code IS 1893 (Part-4): 2024.

3.2 SUGGESTED DAMPING (IN PERCENTAGE OF CRITICAL) VALUES

Component	Damping Value (%)
All piping except for the following systems	2.0
Integrated systems (i.e. piping modeled alongwith vessel/equipment and structure)	5.0

4. CRITERIA FOR REQUIREMENT OF SEISMIC ANALYSIS

Seismic analysis has to be performed when the piping satisfies any one of the following criteria:

(i) All emergency service lines such as fire water line of diameter 10" and above
(ii) All two-phase flow lines having slug flow of diameter 12" and above
(iii) All lines with 900 # and higher-pressure class of diameter 16" and above
(iv) For those lines which do not come under any of the above types, following criteria shall be considered:

For elevations* < 25.0 m	For elevations* ≥ 25.0 m
Line diameter 26" and above	Line diameter 16" and above

***** Elevation of highest portion of piping

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IMPORTANT NOTES:

1. Gapped restraints/supports which are effective in operating load condition shall be treated as full restraints/supports while carrying out seismic analysis.
2. Only mechanical restraints including snubbers and sway braces should be considered in seismic analysis. Frictional resistance should not be considered as a restraint.
3. Only operating temperature and pressure need to be considered for load combinations involving the seismic effect.

5. LOAD COMBINATIONS

All supports should be adequate for the following load combinations due to seismic load alone in addition to other load conditions considered for the design of piping:

(i) Sustained load + Seismic load
(ii) Sustained load + Thermal load (operating) + Seismic load

However, the stress in the piping should be checked only for the first load case (i.e., sustained load + Seismic load) and the maximum stress in the pipe should be limited to 1.33 times the allowable stress at the maximum operating temperature.

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कान्ट्रैक्टर और पैकेज क्रय आदेश के लिए निरीक्षण कार्यप्रणाली तथा समन्वय कार्यविधि- बीना पेट्रोकेमिकल और रिफाइनरी विस्तार परियोजना-बीपीआरईपी

Inspection Methodology & Co-ordination Procedure for Contractor's & Package Suppliers for Bina Petchem and Refinery expansion Project-BPREP.

2	07.03.2025	Issued for implementation-Revised	AA	GS	HOD(I)
1	17.02.2025	Issued for implementation-Revised	AA	GS	HOD(I)
0	08.02.2025	Issued for implementation	AA	GS	HOD(I)

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Abbreviations:

CD	:	Compact Disc
CV	:	Curriculum Vitae
EIL	:	Engineers India Limited
EPC	:	Engineering, Procurement &Construction
FPO	:	Foreign Procurement Office
H	:	Hold Point
HO	:	Head Office
IBR	:	Indian Boiler Regulations
IC	:	Inspection Certificate
ICP	:	Inspection Categorization Plan
IR	:	Inspection Report
IRN	:	Inspection Release Note
ITP	:	Inspection and Test Plan
IS	:	Indian Standard
LSTK	:	Lump Sum Turn Key
NDT	:	Non Destructive Testing
P	:	Package Order
M-PMC	:	Managing-Project Management Consultant
PMI	:	Positive Material Identification
PO	:	Purchase Order
PR	:	Purchase Requisition
PS	:	Purchase Specification
PTR	:	Past Track Record
QA/QC	:	Quality Assurance/ Quality Control
QAP	:	Quality Assurance Plan
QTY	:	Quantity
R	:	Review
RW	:	Random Witness
RCM	:	Resident Construction Manager
RPO/BO	:	Regional Procurement Office/Branch Office
TPIA	:	Third Party Inspection Agency
W	:	Witness

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Note: All documents referred herein are as specified in contract.

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1.0 PURPOSE

The purpose of this document is to detail out the Inspection Methodology & Co-ordination procedure to be adopted for ensuring the quality of the materials being supplied and defines the roles of various agencies involved and the quality system to be adhered to.

2.0 SCOPE

This document is applicable for inspection methodology and coordination procedure of all material to be supplied by the contractor & package orders.

3.0 REFERENCES: This document shall be read in conjunction with the following documents.

a. Bid/Contract Document/Purchase Requisition.

b. Guidelines for Item Categorization Plan (Document No. B957-8-1842-0004) as attached with the Contract documents.

4.0 DEFINITIONS

4.1. OWNER:

Owner shall mean the project owner-BPCL.

4.2. EPMC:

EPMC shall mean Engineers India Limited (EIL).

4.3. CONTRACTOR:

Contractor means any party whose scope includes Engineering, Procurement, Construction and Commissioning of the Unit / Facilities / System covered under the specified scope of work as per the Contract document.

4.4. PACKAGE SUPPLIERS:

Package supplier means any party on which package orders are directly placed by EIL/Owner.

4.5. SUPPLIER

Supplier means any party supplying any of the equipment, material, products and services to the Contractor/Package supplier.

4.6. SUB SUPPLIER

Sub supplier means any party on whom supplier suborders materials and items and whose role is defined in approved ITPs. / QAPs.

4.7. STANDARD INSPECTION AND TEST PLAN (Standard ITP):

EIL's Inspection and Test Plan attached with Bid/Tender documents.

4.8. THIRD PARTY INSPECTIONAGENCY (TPIA):

Third Party Inspection Agency means an inspection agency appointed for carrying out Inspection and witness of tests of item being procured by the Contractor & Package supplier.

4.9. INSPECTION AND TEST PLAN (ITP) / QUALITY ASSURANCE PLAN (QAP):

It is a document generated by the supplier based on the Standard ITP attached with Bid/Tender documents with complete listing of various Inspection stages, tests, reference documents material certification, recording documents requirements and parties involved indicating their roles in various Inspection stages viz. Hold Point(H), Witness Point(W), Random Witness Point (RW) and Review Point (R) of Quality control documents / records for an item.

For items for which Standard ITP are not attached with the Bid/Tender documents:

- Contractor and Package supplier shall generate their own ITP/QAP and shall submit the same for review & approval by EIL/BPCL.

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4.9.1 HOLDPOINT(H):

A Hold Point is a stage designated in the ITP/QAP, which requires Witness Inspection before supplier can proceed with further processing, except for cases where prior written permission for waiver of Witness Inspection by EIL is obtained.

4.9.2 WITNESS POINT(W):

A Witness point is a stage designated in the ITP/QAP, which requires physical Witness Inspection. Contractor and Package supplier shall give proper notifications with a firm schedule to all concerned parties and coordinate with them to complete the stage before proceeding with further processing. In case any or all concerned parties unable to turn up on the scheduled date and time, the Contactor/Supplier shall proceed with the further processing, unless notified otherwise.

4.9.3 RANDOM WITNESS POINT (RW):

A Witness point is a stage designated in the ITP / QAP, which requires witness Inspection on randomly selected samples by inspection engineer. Contractor and Package supplier shall give proper notifications with a firm schedule to all concerned parties and coordinate with them to complete the stage before proceeding with further processing. In case any or all concerned parties unable to turn up on the scheduled date and time, the Supplier shall proceed with the further processing, unless notified otherwise.

4.9.4 REVIEW POINT(R):

A review point is a stage designated in the ITP/QAP which requires the concerned agencies to verify the documents for their correctness and to confirm that the said documents meet the requirements laid down.

4.10. INSPECTION CATEGORY:

Inspection category determines the scope of Inspection for the Supplier, Contractor/TPIA and Package supplier and EIL / OWNER for various materials depending upon criticality as identified in the Item Categorization Plan (ICP) generated as per Table-1 of document No. B957-8-1842-0004 (Guidelines for Item Categorization Plan) enclosed herewith.

4.11. QUALITY CONTROL RECORDS:

These are the documents, which demonstrate achievement of required Quality and effective operation of quality systems during manufacturing of an item as per QAP / ITP. These may include but not limited to following:

- Quality Assurance Plan
- Manufacturing & Quality Control Procedure
- Inspection test plan
- Procedure Qualification Records
- Material Test Certificates
- Stage Inspection Records /Test Reports
- Visual and dimensional inspection records
- Calibration Records
- NDT records
- PMI reports
- Pressure test reports
- Statutory certifications
- Another test reports as specified in relevant codes/ specifications.

4.12. INSPECTION COORDINATOR / INSPECTION MONITOR

An Inspection engineer who is domain expert at EIL-HO/RPO/BO/FPO, nominated by HOD (Inspection), Engineers India limited as nodal officer.

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5.0 INSPECTION OFFICES OF EIL

- Head Office (HO): Inspection Dept., Engineers India Limited, 1, Bhikaji Cama place, New Delhi-110066, India, Phone-+91-11-2676-2121
- Branch Office (BO): Engineers India Bhavan, Plot-85, Sector-11, Kharghar, Navi Mumbai, Maharashtra, PIN-410210, India, Phone: +91-22-2774-0051
- RPO-Ahmedabad: Engineers India Bhavan, Survey No.256, Opp. Sehjanand Tower, Sterling Hospital Road,Gurukul Road, Memnagar, Ahmedabad, Gujarat 380052, India, Phone:+91-79-27497962
- RPO-Bengaluru: 2nd floor, PR Plaza, No-5, Vatal Nagaraj Road, Okalipuram, Bengaluru, Karnataka 560021 Phone: +91-80-23125630
- RPO-Chennai: 2nd Floor, Engineers India Bhawan, Plot No. F-9, SIPCOT IT Park First Main Road, Siruseri, Chennai-603 103, Tamilnadu,India,Phone-+91-44-27469401/2
- RPO-Hyderabad: Engineers India Limited, 79 Bldg.,BHEL, R.C.Puram, Hyderabad, PIN:502032, Telegana, India, Phone :+91-40-29568377/ 88
- RPO-Kolkata: Engineers India Limited, 125/1, 5th Floor, A.G. Towers, Park Street, Kolkata, West Bengal, PIN-700017, Phone:+91-33-22265190
- RPO-Vadodara: Engineers India Limited , 4th & 5th Floor, Meghdhanush Complex, Transpek Circle, Race Course Road, Vadodara – 390 015, Gujarat, India, Phone: +91-265-2340503.
- RPO-Pune: 14, Boat Club Rd, Sangamvadi, Pune, Maharashtra 411001, Phone: +91-20-26163521, 26161196, 26169563, 26160589
- EIL-London (FPO): 487, Great West Road, Hounslow, Middlesex, Post Code-TW5 0BS, London, United Kingdom, Phone: +44-208-570-5530
- EIL-Shanghai: Room No. 1621,16th Floor, V-Capital Mansion,333 Xian Xia Road, Shanghai – 200 336, China, Tel.: +86-21-31030084,
- EIL-Italy: Milan Apartment Rental, Apartment 112, Piazza Luigi di Savoia 28, Milan – 20124, Italy, Tel.: +39-0236533017, +39-3384678867

6.0 METHODOLOGY AND CONTROLS

6.1 GENERAL

6.1.1 The Contractor/Package supplier maintain an effective Quality Assurance System, to ensure that all materials supplied for the Project meet the required Quality standards and specifications.

6.1.2 TPIA shall be appointed by the contractor/Package supplier.

6.1.3 **PROCUREMENT:**

a. All materials shall be procured from the Suppliers approved by EIL / OWNER as per the contract requirements.

b. In case for any item, project vendor/supplier list is not available, Contractor/Package Supplier shall seek specific approval prior to placement of sub-orders on any other Vendor.

6.1.4 Contractor/Package supplier shall ensure that all requisite facilities including testing equipment/Instruments /Gauges having calibration validity with certificate are made available to Inspection Authorities.

6.1.5 EIL/Owner reserves the right to visit supplier / sub suppliers' works at any stage during order execution.

6.1.6 Supplier/sub-supplier shall engage only one approved TPIA for all stages of inspection of project including procedure qualification.

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6.2 CATEGORIZATION

6.2.1. Various materials to be procured by the Contractor/Package supplier depending upon their criticality shall be categorized into following inspection categories for carrying out inspection and testing.

6.2.2. Contractor/Package supplier shall submit at the time of Kick Off Meeting or earlier, the "Categorization Plan for inspection" of all materials to be procured by them for approval, to EIL (Inspection coordinator) and OWNER.

6.2.3. This should include major sub-ordered items, source (Indigenous & Imported) and quantity. Individual ITP for each item shall be submitted to the concerned RPO (where Contractor and Package supplier is located) for their review and approval of individual ITP by EIL-Inspection engineer as per the approved categorization plan.

6.2.4. For site fabricated packages, these documents shall be submitted to RPO nearest to the site.

6.2.5. All material supplied by the Contractor/Package supplier to the Project shall be categorized as Category "A", "B", "C" and "P" as per Table-1 of Document No. B957-8-1842-0004 (Guidelines for Item Categorization Plan) attached herewith.

I. Category-A (Critical Items/Equipment):

- QAP/ITP review by Supplier & Contractor/package supplier & TPIA and approval by EIL.
- All stage & final Inspection witness including documents review and issuance of Inspection Release Note (IRN) by TPIA.
- Witness of stages & Final inspection by EIL including document review & endorsement of IRN.

II. Category-B (Major items / equipment):

- QAP/ITP review by Supplier, Contractor/package supplier & TPIA and approval by EIL.
- All stage & final Inspection witness including documents review and issuance of Inspection Release Note (IRN) by TPIA.
- Witness of Final inspection including document review and endorsement of IRN by EIL.

Note: Though the stage Inspection by EIL has not been envisaged for Category 'B' items, EIL reserves the rights to witness inspection of any stage which shall be decided during ICP/QAP approval stage based on the process criticality and the contract between Owner and EIL.

III. Category-C (Regular items):

QAP/ITP review by Supplier, contractor/package supplier & TPIA and approval by EIL.
Witness of stage & final Inspection including documents review and issuance of Inspection Release Note (IRN) by TPIA and IRN endorsement by EIL.

IV. Category P (Package Order):

All items/components under supply in the Package shall be categorized as Category A, B & C as explained in Clause no. 6.2.5 above. Package supplier shall generate the 'ICP' accordingly and the same shall be approved by EIL.

Notes:

a. Contractor & Package supplier to appoint the 'Third party Inspection Agency-TPIA'. List of approved TPIA's shall be shared as per contract.

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b. In case (for category A and B items), items are to be released based on Inspection by TPIA and review of documents, endorsement by EIL, the same shall be done by the respective RPO/BO/FPO of EIL where supplier / sub-supplier is located.

c. Items coming under the purview of IBR will not have any role of EIL, either in Inspection or documentation reviews.

d. Items under the purview of ASME Code stamps-EIL Inspection Stages shall be identified in ITP as per Categorization plan.

For imported items QAP/ITP review is by Supplier & Contractor/package supplier & TPIA and final approval of QAP/ITP will be by EIL.

6.3 INSPECTION AND TEST PLAN / QUALITY ASSURANCE PLAN (ITP/ QAP):

EIL's Standard ITPs for major items are attached to the bid documents. These ITPs are indicative and generic only. Based on these ITPs, Contractor/Package supplier shall generate detailed ITPs, applicable to the specific item ordered. However, none of the stages shall be waived in detailed ITPs/QAPs without the consent of EIL. Wherever EIL's ITP is not attached, the Contractor/ Package supplier shall generate the detailed ITP.
The ITP/QAP shall give complete listing of stages of inspection, final inspection, tests and material certification requirements for the item, meeting all requirements specified in the Contract Document / Approved project specifications / Approved Drawings & Data sheets and shall clearly indicate Hold (H), Witness (W) Inspection, Random Witness (RW), Review (R) stages of inspection to be carried out by TPIA and EIL. For the supplier, all the stages of inspection shall be HOLD points and no stage shall be offered to TPIA & EIL without having performed / witnessed such stages. The ITP thus generated shall identify and include the following as minimum:

Sequence of all inspection and test activities related to the item manufactured, specific procedures, methods and work instructions to be applied to each activity in manufacturing of the item.

This will include but not limited to:
Material identification/traceability records,
Qualification of welding, welders, welding operators,
NDT procedures & personnel,
Post Weld Heat Treatment procedures,
Positive Material Identification (PMI) including that of welds @ at least10% at random,
Visual / dimensional checks.
Pressure tests,
Performance tests,
String tests, strip tests,

Respective acceptance criteria and pre-shipment clearing procedures etc. as the case may be.

The Contractor/Package supplier may opt for making their own Standard ITP/QAP for each bulk items viz. fittings, flanges, valves, pipes, hoses, gaskets, fasteners, cables, cable glands, instrument tube & fittings, pressure gauge, temperature gauge, level gauge, manometers etc. and go for one time approval for each item type. In case of any non-conformity EIL reserves the right to cancel/amend ITP.

The Contractor/ Package supplier may also opt for using EIL's Standard ITP attached to the bid documents.

The Contractor/Package supplier shall ensure that all personnel engaged in performing the activities have requisite qualification and relevant work experience. Wherever required, specialized operators shall be qualified and certified.

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NDT operators employed, if any, shall be certified as per ASNT / ISNT and shall have valid certificates.

6.4 INSPECTION

6.4.1. The Contractor shall notify in writing to the respective RPO/BO/FPO of EIL coordinating the Contractor's order and with a copy to the OWNER, at least 7days in advance of the date and the place at which the item will be ready for witnessing inspection / testing by EIL and/or OWNER. Following documents shall be submitted along with inspection notice:

- Un priced copy of Purchase Order
- Approved Purchase Requisition
- Approved Drawings
- Agreed Deviations
- Approved QAP / ITP
- Approved Categorization Plan.

6.4.2. The TPIA shall issue an Inspection Certificate-IRN after satisfactory Stage wise & Final inspection including documents review in compliance to 'H', 'W', 'RW'&' R' stages of inspection by all parties as per approved ITP/QAP, PR, Purchase specifications, standards/codes etc.

6.4.3. The Inspection Certificate shall give reference of the purchase order, approved engineering documents (PR, drawings etc.) and approved ITP referred for inspection and tests carried out. The inspection certificate shall list out short supplies / pending work details, if any and order status viz. Partial/Complete.

6.4.4. In case Contractor/TPIA find any deviation or non- conformity with respect to the agreed specifications during manufacturing of the item and where corrective action is not feasible, the Contractor shall report the same to EIL in the designated "Waiver / Deviation Request" format and seek prior approval from EIL/ Owner as applicable, before proceeding further.

6.4.5. The Contractor shall ensure that all items covered by statutory regulations are inspected at the manufacturer's works and are duly certified by competent authority as per stipulated requirements. For such items EIL intervention, if any, shall be indicated in QAP.

6.4.6. Pre-fabricated modules shall be inspected and tested and witnessed by EIL & TPIA as per approved ITP / QAP before dispatch from shop / yard.

6.4.7. Material/ equipment shall be inspected only after receipt of drawings / data sheets approved by EIL/Owner (as applicable) in Code 2. However, dispatch clearance shall be after Code-1 approval.

6.4.8. The Contractor/TPIA shall check the calibration status and traceability of all instruments used by the supplier for testing. Contractor shall submit all NDT calibration blocks along with equipment.

6.4.9. All bulk items like pipes, fittings, fasteners etc. shall be color coded as per instructions given in the specifications by the Supplier and witnessed by Contractor/TPIA.

6.4.10. The Contractor/TPIA shall carry out physical verification of all spares and check their Tag No., Serial No., Model No., Quantity, Model, Size, Rating etc. and review manufacturer's test reports / certificates, Material test certificates etc. to confirm compliance to requirements. Random witness samples shall be selected separately for each inspection stage.

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6.4.11. In case any item is found not complying to the specifications laid down in the contract, it shall be the responsibility of the contractor to ensure replacement / rectification of the equipment/material, as decided by EIL / OWNER.

6.4.12. EIL scope of inspection at foreign supplier works (imported items) shall be as per contract. Contractor, package supplier to appoint TPIA for inspection of imported items.

6.5 INSPECTION CERTIFICATE(IC) / INSPECTION RELEASE NOTE (IRN):

6.5.1. The TPIA issue an IC/IRN after satisfactory completion of all required stages of Inspection as per approved QAP / ITP and after ensuring compliance to specified requirements of all relevant applicable documents. The Inspection Certificate shall give reference of the approved documents including Purchase Requisition /Specification, Drawing, Data sheet, QAP/ITP with revision number referred for inspection and tests carried out, balance activities and short supplies if any.

IC/IRN to be issued only after drawings / data sheets are approved by EIL in Code1/R, unless agreed otherwise.

6.5.2. The IC/IRN shall include the following as minimum.

- Job No. / Project Title / PO No. / Purchase Specification No., Date of inspection and Status of the visit - Initial / Intermediate / Final.
- Item Tag No. / Name / Total quantity ordered / released / offered for inspection and accepted during the visit.
- Manufacturer's Name, Package contractor's name, EIL& OWNER
- Date & Place of Inspection, name of Inspection Agency and Inspection Authority.
- Reference of Documents with Revision status. (It shall be clearly indicated in the inspection certificate that "inspection has been carried out based on code-1 drawings and approved ITP" and comply all PR/Specification requirements.)
- Verification of calibration documents.
- Details of Inspection carried out.
- Results of Inspection.
- Deviations, if any.

6.5.3. IC/IRN issued by the TPIA shall be accompanied with the following as minimum.

- Works Certificate with details of Hydrostatic Test and PMI / Leak Tests (if applicable) for Fabricated equipment
- Works Certificate with details of Performance Test, Mechanical Run Test (if specified in PR) and String Test (if applicable) for Rotating Equipment
- Works Certificate with details of acceptance tests, calibration and Certificate of statutory approvals if applicable.
- Works Certificate with details of Mechanical tests, PMI and Helium Leak tests including lab test reports, if applicable, for all bulk items such as pipes, valves, fittings, fasteners and gaskets.

6.5.4. Contractor shall submit copy of each Inspection Certificate (IC) / Inspection Release Note (IRN), along with all attachments mentioned therein to EIL for IC/IRN endorsement. After IC/IRN is endorsed, Contractor shall distribute the Inspection Certificate to the following officials:

- Project Manager of EIL.
- Inspection Coordinator/Monitor of EIL.
- Resident Construction Manager (RCM) of EIL.
- Owner's Representative at Site.
- Contractor's Ware-house in-charge.

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- EIL/Owner warehouse in-charge at site.

Contact details of all concerned will be intimated after kick off meeting.

Immediately after dispatch, the CONTRACTOR shall submit one set of all documents listed in the "Vendor Data Requirement" sheet attached with the PR/ Contract to RCM of EIL with a copy to owner representative & EIL/owner warehouse in-charge.

7.0 EXPEDITING: The contractor shall perform expediting services of all equipment & materials. Expediting Reports (Fortnightly) shall be generated Purchase Order wise & Vendor wise separately. A standard format to be agreed upon during the kick of meeting with EIL/owner. A consolidated 'Material Status Report-MSR'-Monthly to be furnished including dispatch status. Dedicated qualified experienced manpower shall be deployed at the major centers for expediting services. If required dedicated manpower will be positioned at the vendor works also. In addition to the contractor, EIL will also expedite for identified critical fabricated items or any other item shall also be expedited on case-to-case basis as per job exigencies.

8.0 DOCUMENTATION AND CONTROLS:

8.1 FINAL DOCUMENTS:

On completion of each order, contractor shall submit the final documents to the EIL/Owner in requisite number of hard copies/soft copies (Pen drive/CD) as per the vendor data requirements attached with PR duly reviewed and certified/endorsed by the nominated TPIA & EIL with Seal /stamp at least on the index sheet of final documents/ data folder along with Certificate of Completeness of Final Documentation. Hard copies shall be sent directly to EIL Site office with a soft copy to EIL's Project Manager. Drawings in 'Final documents' shall consist of editable copies also. Final document shall be in one complete binder with proper indexing so as to corelate/retrieve document from binder

8.2 STATUS & MONITORING REPORT:

CONTRACTOR shall closely monitor the manufacturing progress at Supplier's works for various orders and expedite timely delivery of all items at site. If required and found necessary, visits to Supplier shops by EIL/OWNER and meetings with Suppliers shall be organized by the CONTRACTOR. In case of any delay in supply of the items by any supplier, the CONTRACTOR shall initiate remedial actions for expediting delivery of the items.

CONTRACTOR shall submit status report of all procurement items and related information, to the Inspection Coordinator of EIL on a FORTNIGHTLY basis. Reporting Format to be finalized during Kick off meeting (KOM) with the EIL/Owner.

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Annexure-I Matrix of Inspection and Certification Responsibility

Activities	Contractor / Package Supplier	Category-A		Category-B		Category-C	
		TPIA	EIL	TPIA	EIL	TPIA	EIL
ICP	To submit	Approval by EIL					
ITP Document	Review	Approval required	Approval required	Approval required	Approval required	Approval required	Approval required
Providing approved drawings to EIL	To Provide	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Stage Inspection	To perform	Applicable	Applicable	Applicable	Not Applicable (Refer Note 1)	Applicable	Not applicable
Final Inspection	To perform	Applicable	Applicable	Applicable	Applicable	Applicable	Not Applicable
Issue of Inspection certificate	To endorse IRN.	To Issue	Endorsement of IRN.	To issue	Endorsement of IRN.	To issue	Endorsement of IRN.
Distribution of inspection certificate with attachments	To distribute As per contract documents	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Final documents (Note-3)	To submit as per Contract document, after endorsing the certification by contractor.	To certify the completeness of the documentation.	To verify & endorse the completion certificate.	To certify the completeness of the documentation .	To verify & endorse the completion certificate.	To certify the completeness of the documentation .	To verify & endorse the completion certificate.

Notes:

1. Though the stage Inspection by EIL has not been envisaged for Category 'B' items, EIL reserves the rights to witness inspection of any stage which shall be decided during ICP/QAP approval stage based on the process criticality and the contract between Owner and EIL.
2. Items not covered in Table-1 of Doc. No. B957-8-1842-0004 shall also be categorized in consultation with Owner / EIL.
3. For Category 'P' items, Package supplier shall submit Final Documents on completion of scope of works or as defined in PO/PR.
4. Flanges, tube sheets, non-standard forgings, forged fittings and Orifice plates/forgings (CS, LAS, SS) of rating 1500# & above shall be considered as 'category-A' item.
5. All types of valves of pressure class 1500# & above shall be considered as 'category-A' items.
6. RTJ-octagonal and 1500# & above ratings gaskets shall be considered as 'category-B' items.

Notwithstanding the above, EIL / Owner reserves the right to participate in any stage / final inspection

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आइटम वर्गीकरण योजना के लिए दिशा-निर्देश- बीना पेट्रोकेमिकल और रिफाइनरी विस्तार परियोजना- बीपीआरईपी

GUIDELINES FOR ITEM CATEGORIZATION PLAN FOR BINA PETCEHM AND REFINERY EXPANSION PROJECT-BPREP.

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
2	07/03/2025	Issued for implementation- Revised	AA	GS	HOD(I)
1	17/02/2025	Issued for implementation- Revised	AA	GS	HOD(I)
0	08/02/2025	Issued for implementation	AA	GS	HOD(I)

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Abbreviations:

BO	:	Branch Office
EIL	:	Engineers India Limited
EPC	:	Engineering, Procurement &Construction
EPCM	:	Engineering, Procurement and Construction Management
ICP	:	Inspection Categorization Plan
ITP	:	Inspection and Test Plan
LSTK	:	Lump Sum Turn Key
P	:	Package order
M-PMC	:	Managing-Project Management Consultant
QAP	:	Quality Assurance Plan
TPIA	:	Third Party Inspection Agency
W	:	Witness

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1.0 PURPOSE

The purpose of this document is to provide guideline for preparation and approval of item Categorization Plan for Inspection and defines the Inspection scope for various agencies for the Project.

2.0 SCOPE

This guideline is applicable for all material to be supplied by the Contractors and Package orders.

3.0 REFERENCE:

This document shall be read in conjunction with document no. B957-5-1842-0005 **"Inspection Methodology & Co-ordination Procedure for contractor & Package Supplier"** attached to the Contract and other documents mentioned therein.

4.0 ITEMS DO NOT FALL UNDER THIS CATEGORIZATION PLAN:

Contractor / Package supplier should get in touch with 'RCM-Resident Construction Manager' for methodology/ acceptance of these items.

- Cement, Reinforcement bars
- Structural steel material & plates as per IS-2062. Hand railing material
- Wrapping & Coating material.
- Paints, Chemicals and Cleaning agents
- Oil lubricants, Insulation material & Earthing material
- Hardware used at Site for Electrical and Instrumentation items.
- Loose spares
- Any other non-critical item.

5.0 ITEM LIST AND CATEGORY:

Item list is mentioned in the Table-1 of this document. Item not covered in the table-1/ exempted item list as per clause 4.0 of this document, shall also be categorized and submitted for approval from EIL.

Note: The category of items mentioned in the Table-1 is standard. EIL reserves the rights to alter the category of item based on the Process criticality and Client requirement, during approval of ICP/QAP.

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Table-1

Sr.No.	Item Description	Item Category	Remarks
1	A.C. VARIABLE SPEED DRIVE(VFD) SYSTEM	A	
2	ACCESS CONTROL SYSTEM	C	
3	ACID RESISTANT BRICKS	C	
4	ACID RESISTANT CASTABLE	C	
5	ACID RESISTANT MORTAR	C	
6	ACSR CONDUCTOR	C	
7	ACTUATORS-MOV	C	
8	ADDITIVE MIXING SYSTEM	B	
9	ADDITIVE UNLOADING SYSTEM	P	
10	AERIAL TOWER WAGONS	C	
11	AGITATOR	B	
12	AIR CONDITIONING SYSTEM - CENTRAL	P	
13	AIR CONDITIONING SYSTEM - PACKAGE UNIT	P	
14	AIR FIN COOLER	A	
15	AIR HANDLING & FAN COIL UNIT	C	
16	AIR HEATER (DIRECT FIRED)	C	
17	AIR PRE-HEATER (CAST)	B	
18	AIR PRE-HEATER (GLASS TUBE)	B	
19	AIR SETTING MORTAR	C	
20	AMBIENT AIR ANALYSER SYSTEMS	B	
21	ANALYSER (AIR DEMAND/TOTAL SULPHUR)	B	
22	ANALYSER SHELTER	B	
23	ANALYSER SYSTEMS	B	
24	ANALYSER-DENSITY/SP. GRAVITY (NUCLEONIC/ VIBRATION CYLINDER/ CORIOLIS TYPES)	B	
25	ANALYSERS (HYDROGEN SULPHIDE)	B	
26	ANALYSER-STATIC PROBES	C	
27	ANODES FOR C P SYSTEM	C	
28	AUTO DCP EXTINGUISHING SYSTEM	C	
29	AUTOMATIC GAS SAMPLER	C	
30	AUTOMATIC LIQUID SAMPLER	C	
31	BAG SLITTING PACKAGE	P	
32	BAG STICHING MACHINE	C	
33	BAGGING & PALLETIZING LINES	P	
34	BALL MILLS	C	

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Sr.No.	Item Description	Item Category	Remarks
35	BARREL RECLAIMER	C	
36	BATTERIES-LEAD ACID (FLOODED)	C	
37	BATTERIES-LEAD ACID (VRLA)	C	
38	BATTERIES-NICKLE CADMIUM	C	
39	BATTERY CHARGERS	B	
40	BELT SCALE	B	
41	BELT WEIGH FEEDER	B	
42	BLENDING AUTOMATION SYSTEMS	A	
43	BLOWER-TURBO CENTRIFUGAL	A	
44	BOILER - INDUSTRIAL WATER TUBE >25TPH	B	
45	BOILER - WASTE HEAT (PACKAGE)	P	
46	BOILER- CO	P	
47	BOILER- PACKAGE(FIRE TUBE UP TO 25 TPH)	P	
48	BOILER-FLUIDISED BED COMBUSTION	P	
49	BOWL MILLS	C	
50	BRANCH PIPES	C	
51	BURNER-CONVENTIONAL	C	
52	BURNER- LOW Nox (PROCESS FIRED HEATER)	B	
53	BURNER-SRU	C	
54	BUS DUCTS	B	
55	CABLE GLANDS (HAZARDOUS AREA)	C	
56	CABLE TERMN. & JOINTING KIT	C	
57	CABLE TRAYS-FRP	C	
58	CABLES - EXTRA HIGH VOLTAGE(220KV & ABOVE)	A	
59	CABLES COMMN. (JELLY FILLED)	B	
60	CABLES:CONTROL-PVC	C	
61	CABLES-FIRE ALARM AND COMMN.	B	
62	CABLES-HIGH VOLTAGE& EXTRA HIGH VOLTAGE UPTO 132KV)	B	
63	CABLES-MEDIUM VOLTAGE-POWER-PVC	C	
64	CALCIUM SILICATE PRODUCTS	C	
65	CAPACITORS-HIGH VOLTAGE	B	
66	CAST PLUG HEADER & PRESSURE FITTINGS	C	
67	CASTINGS - TUBE SHEET/TUBE SUPPORT	B	
68	CATALYST DRUM EMPTYING DEVICE	B	
69	CATALYST DRUM TILTING DEVICE	C	
70	CATALYST LOADING - UNLOADING SYSTEM	P	
71	CATHODIC PROTECTION POWER SUPPLY MODULE	C	
72	CCR PLATFORMING REACTOR	A	
73	CCTV & CCTV SYSTEM	B	

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Sr.No.	Item Description	Item Category	Remarks
74	CENTRIFUGE	B	
75	CENTRIFUGE-SMALL METALLURGICAL	B	
76	CERAMIC FIBRE PRODUCTS	C	
77	CHAIN PULLEY BLOCK	C	
78	CHASIS MOUNTED FIRE FIGHTING EQUIPMENT	B	
79	CHLORINATOR	C	
80	CIRCUIT BREAKER -EHV(OUTDOOR)	B	
81	CIRCUIT BREAKER -HV (OUTDOOR)	B	
82	CITY DISTRIBUTION METERING SYSTEM	B	
83	CLAMP CONNECTOR	C	
84	CLEAN AGENT SYSTEM	C	
85	COAL TAR COAING TAPES	C	
86	COALESCER	A	
87	COATING MATL.(CTE/PRIMER)	C	
88	COLUMN/TOWER	A	
89	COLUMN TRAYS	B	
90	COMP. HIGH PRESSURE (PIANS)	A	
91	COMPACT FLANGE	C	
92	COMPACT STEAM TRAPING ASSY+SS/CR MANFOLD	C	
93	COMP-CENT.(SPP)	A	
94	COMP-CENT.P.I.G(PIA)	A	
95	COMP-EXPANDER(AIR)	A	
96	COMP-EXPANDER(PRO)	A	
97	COMP-MOBILE	B	
98	COMP-RECIPRO(DIAPHRAGM)	A	
99	COMP-RECIPRO(LABYRINTH)	A	
100	COMP-RECIPRO(PIANS)	A	
101	COMP-RECIPRO(SPP)	A	
102	COMP-ROT.LIQUID RING / VP(AS)	A	
103	COMP-ROT.LIQUID RING/VP(PS)	A	
104	COMP-ROT.LOBE/VP(AS)	A	
105	COMP-ROT.LOBE/VP(PS)	A	
106	COMP-ROT.SCREW(PIAS)	A	
107	COMP-ROT.SCREW(PS)	A	
108	CONDENSATE POLISHING UNIT	P	
109	CONTNUOUS EMISSION MONITORING SYSTEM	B	
110	CONTROL CABLE - FIRE SURVIVAL	B	
111	CONTROL PANEL & ACCESSORIES	B	
112	CONTROL PANEL (FLP)	B	
113	CONTROL STATIONS- WEATHERPROOF	C	

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Sr.No.	Item Description	Item Category	Remarks
114	CONTROL STATIONS-FLAME PROOF	C	
115	CONTROL VALVE ELECTRO-HYDRAULIC ACTUATOR	C	
116	CONTROL VALVE POSITIONER	C	
117	CONTROL VALVES , ON-OFF VALVES , SELF ACTUATED PRESSURE / FLOW CONTROL VALVES	B	
118	CONVEYOR	P	
119	COOLING TOWER - CONCRETE	B	
120	COPPER TUBES(COATED,BARE)	B	
121	CORROSION MONITORING SYSTEMS	P	
122	CRANE- E.O.T (HAZARDOUS AREA)	B	
123	CRANE- E.O.T (SAFE AREA)	B	
124	CRANE H.O.T. (HAND OPERATED)	C	
125	CRANE MOBILE (CRAWLER/TYRE MOUNTED)	C	
126	CRUDE & VACUUM COLUMN	A	
127	CRUDE DESALTER	A	
128	CRUSHER (CONE, GYRATORY, HAMMER, JAW)	C	
129	CRUSHER ROLLER	C	
130	CRUSHING SYSTEM	B	
131	CRYOGENIC AIR SEPARATION PLANT	P	
132	CRYOGENIC VAPORIZER-DIRECT STEAM HEATED	C	
133	CRYSTALLIZERS	B	
134	CT/PT OUTDOOR (EHV)	B	
135	CYCLONES (HYDRO)	B	
136	CYCLONES (PNEUMATIC)	B	
137	CYCLONES(REACTOR & REGENERATOR)	A	
138	DAMPER(FOR FIRED HEATER/AIR PREHEAT SYS)	C	
139	DAMPERS FOR GAS TURBINE APPLICATION	C	
140	DELUGE VALVE AND HEAT DETECTORS	C	
141	DEMISTER-VANE TYPE	C	
142	DEMISTER-WIRE MESH TYPE	C	
143	DENSE REFRACTORY CASTABLE	C	
144	DESUPERHEATERS & PRDS	B	
145	DG SET	B	
146	DIESEL ENGINE(UPTO 1000KW)	C	
147	DIESEL ENGINE(ABOVE 1000KW)	B	
148	DIFFERENTIAL PRESSURE GAUGES	C	
149	DISTRIBUTED CONTROL SYSTEMS (PACKAGE)	P	
150	DOSING PACKAGE (SKID MOUNTED)	A	
151	DRAFT GAUGES	C	

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Sr.No.	Item Description	Item Category	Remarks
152	DRIER - FLASH	C	
153	DRIER-AIR/GAS	B	
154	DRUM LEVEL INSTRUMENTS (BI-COLOUR GAUGE)	C	
155	DRUM LEVEL INSTRUMENTS (ELECTRONIC)	B	
156	DRY COLORIMETRIC (TAPE) DETECTORS	C	
157	DUPLEX/SUPER DUPLEX SS WELDED PIPES	A	
158	DUST/FUME EXTRACTION SYSTEM	C	
159	ECS(BASE+ADVANCE)-REFER ITEM CODE-13SC	A	
160	EI GRID & ASSOCIATED INTERNALS	C	
161	EJECTOR (ENGINEERED)	A	
162	EJECTOR (UNENGINEERED)	A	
163	ELECTRIC HEATER	A	
164	ELECTRIC CONTROL SYSTEM (BASE LEVEL)	B	
165	ELECTRIC CONTROL SYSTEM (BASE+ADVANCE)	B	
166	ELECTRIC HOISTS	C	
167	ELECTROMAGNETIC VIBRATING FEEDER	C	
168	ELECTRONIC WEIGH SCALE	C	
169	ELECTROSTATIC PRECIPITATOR	C	
170	ELEVATOR –BUCKET	C	
171	EMERGENCY GENERATORS (MV)	B	
172	ENMASSE CHAIN CONVEYOR	C	
173	EPABX SYSTEM	B	
174	ESC (BASE LEVEL)-REFER ITEM CODE-13SB	B	
175	EXPANSION JOINT-(FABRIC)	B	
176	EXPANSION JOINT-METALLIC	B	
177	EXPANSION JOINTS (RUBBER)	C	
178	EXTRUDER & PALLETIZER PACKAGE	P	
179	FAN-AXIAL FLOW	A	
180	FAN-ID/FD	A	
181	FASTENERS	B	
182	FEED FLTR AUTO BACK WASH HYD.CRAKR DHDT	B	
183	FIELD BUS SIGNAL CABLES	B	
184	FIELD INSTRUMENTS (P, DP, F, L, T, TD)	B/C	Refer Standard ITP for individual Item.
185	FILTER - BASKET	A	
186	FILTER - CARTRIDGE/CANDLE	A	
187	FILTER - LEAF TYPE	B	
188	FILTER - PRESS	B	
189	FILTER - PRESSURE	B	
190	FILTER BAG TYPE	B	

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Sr.No.	Item Description	Item Category	Remarks
191	FILTER- ROTARY	A	
192	FILTER SEPARATOR	A	
193	FILTER-VACUUM	B	
194	FIRE & GAS DETECTION SYSTEMS	B	
195	FIRE ALARM SYSTEM	B	
196	FIRE EXTINGUISHERS (PORTABLE)	C	
197	FIRE HOSE ACCESSORIES	C	
198	FIRE PROOF DOORS & WINDOWS	C	
199	FIRE PROTECTION SYSTEM (VALVES & ACC.)	B	
200	FITTING BLOCK FORGED-CARBON STEEL	C	
201	FITTING-GRE/FRP/IS1239	C	
202	FITTINGS-FABRICATED(ALL)	B	
203	FITTINGS FROM SEAMLESS PIPES(AS, SS, EXOTIC)	A	
204	FITTINGS FROM SEAMLESS PIPES (CS)	B	Raw material identification for all types of services, “irrespective of Standard ITP requirement”.
205	FITTINGS PIPE CAP (CS, AS, EXOTIC, SS)	A	
206	FITTINGS-FOREIGN AGENTS/STOCKIST/TRADERS	B	Review of 3.2 certification. Sourced from EIL approved Suppliers. Mother product traceability to be ensured.
207	FIXED CO2 SYSTEM	C	
208	FIXED FOAM SYSTEM (FOAM PACKAGE)	P	
209	FLAKING MACHINE	C	
210	FLANGE- CARBON STEEL	B	Items which require Inspection as per Standard ITP.
211	FLANGE(AS, SS and Exotic)	A	
212	FLARE STACK COMPONENTS	P	
213	FLEXIBLE ELASTOMERIC RUBBER	C	
214	FLOW ELEMENTS-ALL TYPES	B	
215	FLOW METERS : (MASS/ MAGNETIC/ VORTEX/ TURBINE/ ULTRASONIC / POSITIVE DISPLACEMENT)	B	
216	FLOW METERS : (VARIABLE AREA / AVERAGING PITOT TUBE)	C	
217	FLOW TEE	B	
218	FLP ELECTRICAL FITTINGS (IMPORTED)	C	

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Sr.No.	Item Description	Item Category	Remarks
219	FLUE GAS COOLER PACKAGE	P	
220	FLUID BED CALCINER	C	
221	FOAM MAKER	C	
222	FORGINGS TUBE SHEET(CS, AS, SS	A	
223	FORK LIFT TRUCK	C	
224	FRP/FRP REINFORCED PVC/PP LINED EQPT.	C	
225	FUME TREATMENT PLANT	P	
226	FURNACE	P	
227	GAS CHROMATOGRAPH: (PROCESS GAS / NATURAL GAS)	B	
228	GAS CONDITIONING SKID	P	
229	GAS DETECTION SYSTEMS	B	
230	GAS ENGINE GENERATING SET	B	
231	GAS METERING SYSTEM (ULTRASONIC/ TURBINE/DUAL CHAMBERS)	A	
232	GAS PRESSURE REDUCING SKIDS	A	
233	GASKET ALL TYPES (IMPORTED& INDIGENOUS)	C	
234	GAUGE GLASSES & COCKS	C	
235	GLASS WOOL INSULATION PRODUCTS	C	
236	GRANULATOR	C	
237	GRINDING & PULVERISING SYSTEM	C	
238	GROUND MONITORING SYSTEMS	C	
239	H V SYSTEM PACKAGE	P	
240	HAMMER BLIND	C	
241	HAMMER MILLS	C	
242	HEADING/UNHEADING SYSTEM - COKE CHAMBER	B	
243	HEAT EXCH. HASTALLOY / HASTALLOY CLAD	A	
244	HEAT EXCHANGER (MONEL/MONEL CLAD)	A	
245	HEAT EXCHANGER (NICKEL/NICKEL CLAD)	A	
246	HEAT EXCHANGER (SS-DUPLEX/SUPER DUPLEX)	A	
247	HEAT EXCHANGER (AL.BRAZED FIN TYPE)	A	
248	HEAT EXCHANGER (PLATES-GASKETTED)	A	
249	HEAT EXCHANGER (3.5% Ni-STEEL)	A	
250	HEAT EXCHANGER (CARBON STEEL)	A	
251	HEAT EXCHANGER (LOW ALLOY STEEL)	A	
252	HEAT EXCHANGER (LTCS)	A	
253	HEAT EXCHANGER NF-(BRASS, CU-Ni)	A	
254	HEAT EXCHANGER (STAINLESS STEEL)	A	
255	HEAT EXCHANGER (TITANIUM/TITANIUM CLAD)	A	
256	HEAT EXCHANGER (PLATE-WELDED)	A	
257	HEAT EXCHANGER (CS/LAS+SS CLAD)	A	

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Sr.No.	Item Description	Item Category	Remarks
258	HEAT EXCHANGER- GRAPHITE	A	
259	HEAT EXCH-HIGH PR(SCREW PLUG/BREACH LOCK	A	
260	HEAT RECOVERY STEAM GENERATOR	P	
261	HEAT TRACERS	C	
262	HIGH MAST LIGHTING SYSTEM	C	
263	HOSE DELIVERY	C	
264	HOSE METALLIC FLEXIBLE SS	C	
265	HOSE- RUBBER (STEAM/GAS/AIR/WATER/CHEM.)	C	
266	HOT INDUCTION BEND	B	
267	HOT TAPPING MACHINE	B	
268	HV/MV SPRAY SYSTEMS	B	
269	HVAC SYSTEM	B	
270	HYDRANT/LANDING VALVE	C	
271	HYDRAULIC DECOKING SYSTEM	P	
272	IMPACTORS	C	
273	INCINERATOR PACKAGE FOR SRU	P	
274	INERT GAS GENERATOR-PSA TYPE	B	
275	INFRARED TEMP MEASUREMENT SYSTEM	C	
276	INLET FEED DEVICE (VANE TYPE - EIL DESG)	C	
277	INLINE INDUCTORS	C	
278	INSTRUMENT BLOWBACK SYSTEM	C	
279	INSTRUMENT TRANSFORMERS CT & PT (HV)	B	
280	INSTRUMENT TRANSFORMERS CT & PT (MV)	C	
281	INSTRUMENT TUBE FITTINGS	C	
282	INSTRUMENT TUBING	C	
283	INSTRUMENT VALVES& MANIFOLDS	C	
284	INSULATING BRICKS	C	
285	INSULATING JOINTS	B	
286	INSULATING REFRACTORY CASTABLE	C	
287	ISOLATOR & EARTHING SWITCH OUTDOOR EHV	B	
288	ISOLATOR OUTDOOR H.V. UP TO 33 KV.	B	
289	ISOLATORS/LOAD BREAK SWITCHES(HV INDOOR)	B	
290	JIB CRANE	C	
291	JUNCTION BOXES (FLAME PROOF)	C	
292	LEVEL INSTRUMENTS-DISPLACER TYPE	C	
293	LEVEL SWITCHES(DISPLACER/FLOAT)	C	
294	LIFTS (PASSENGER & GOODS)	C	
295	LIGHTING & POWER PANELS (FLP)	B	
296	LIGHTING & POWER PANELS (SAFE AREA)	C	

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Sr.No.	Item Description	Item Category	Remarks
297	LIGHTING FIXTURE & ACCESSORIES (NON-HAZARDOUS)	C	
298	LIGHTING FIXTURE & ACCESSORIES (HAZARDOUS)	C	
299	LIGHTING TRANSFORMERS	C	
300	LIGHTNING ARRESTORS	C	
301	LIME PREP. SYSTEM.	C	
302	LIME STORAGE AND SLAKING SYSTEM	C	
303	LINE PIPES (HELICAL SAW)	B	
304	LINE PIPES (LSAW)	A	
305	LINE PIPES (ERW)	B	
306	LINE PIPES (SEAMLESS)	B	
307	LINING (GLASS)	C	
308	LINING (LEAD)	C	
309	LINING (PVC/PE/PP)	C	
310	LINING (RUBBER)	C	
311	LINING-FRP(TANKS & VESSELS)	B	
312	LIQUID METERING SYSTEM (ULTRASONIC/ TURBINE/ PD METERS / MASS FLOWMETERS.)	P	
313	LNG VAPORIZER	B	
314	LOADING ARMS (MARINE)	B	
315	LOADING ARMS (RAIL/ROAD)	C	
316	LONG RADIUS BENDS	B	
317	LONG RANGE MONITOR	B	
318	LOOP POWERED INDICATORS	C	
319	LOUVERS FOR AIR fIN COOLERS	C	
320	LPG FILLING MACHINE	P	
321	M V SYSTEM PACKAGE	P	
322	MACHINE MONITORING SYSTEMS	B	
323	MAGNETIC LEVEL INSTRUMENTS	C	
324	MAGNETIC SEPARATOR	B	
325	MAIN COMBUSTN. CHAMBR PKG(SRU)-ENGINERED	P	
326	MECH.SEAL FOR PUMPS/AGITATORS	C	
327	MELTING CUM HOLDING FURNACE	P	
328	MEMBRANE NITROGEN PLANT	B	
329	MEMBRANE OXYGEN PLANT	B	
330	MEMBRANE UNIT	C	
331	METER PROVERS	C	
332	METERING UNIT PACKAGE (WEIGHING SYSTEM)	P	
333	LT MOTORS(UPTO 415V)	B	
334	MOTOR WITH VFD-ALL RATING	A	

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Sr.No.	Item Description	Item Category	Remarks
335	HT MOTORS ABOVE (415V)	A	
336	MULTICYCLONES	B	
337	MV POWER CABLE - FIRE SURVIVAL	B	
338	NEUTRAL GROUNDING RESISTORS-H.V.	B	
339	NON STANDARD FORGINGS- STAINLESS STEEL	B	
340	NON STANDARD FORGINGS-ALLOY STEEL	B	
341	NON STANDARD FORGINGS-CARBON STEEL	B	
342	NON-PROP PKG,HIGH QUAL DISR& INL-UNENGIN	C	
343	NON-PROP. PACKGS WITH CONVENL INTERNALS	C	
344	NUCLEONIC LEVEL INSTRUMENTS	B	
345	OFFSHORE DECK CRANE	B	
346	ON LOAD TAP CHANGER	C	
347	OPTICAL FIBRE CABLE & ASSOC.ITEM	B	
348	ORIFICE PLATES & FLANGES	B	
349	OUTBOARD STEAM GENERATOR	B	
350	PIG SIGNALLERS	C	
351	PILOT OPERATED SAFETY VALVES	B	
352	PIPE / FITTINGS -PTFE LINED	B	
353	PIPE/TUBE- AS (SEAMLESS)TO ASTM STDS	B	
354	PIPE/TUBE-CS (SEAMLESS)TO ASTM STDS	B	
355	PIPE/TUBE-S.LESS(DUPLEX/SUPER DUPLEX SS)	A	
356	PIPE/TUBE-SS(S.LESS & WELDED)TO ASTM STD	A	
357	PIPE-CARBON STEEL TO INDIAN STANDARDS	B	
358	PIPE-CARBON STEEL(WELDED)TO ASTM STDS	B	
359	PIPE-CLADDED	B	
360	PIPE-FRP/LEAD/PVDF/GRE	B	
361	PIPELINE COATING (COATERS)(CTE/3LPE/FBE)	B	
362	PIPELINE CONNECTORS	C	
363	PIPES & TUBULARS TO A.P.I.STANDARDS	B	
364	PIPES- INDIAN STOCKIST	C	Review of 3.2 certification & Pipe shall be from enlisted suppliers.
365	PIPES -SS WELDED TO A 358	B	
366	PIPES-FOREIGN AGENTS/STOCKIST/TRADERS	C	Review of 3.2 certification & Pipe shall be from enlisted suppliers.
367	PIPE-TITANIUM	B	
368	PIPE-WELDED ALLOY STEEL	B	

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Sr.No.	Item Description	Item Category	Remarks
369	PIPING SYSTEM-CLAD(SHOP FABRICATED)	A	
370	PIPING SYSTEM-GRE/GRP	C	
371	PLANT COMMUNICATION SYSTEM	B	
372	PLASTILATOR	C	
373	PLUGS/SOCKETS/HANDLAMPS (FLAME PROOF)	C	
374	POLYMERISER REACTOR SYSTEM	A	
375	POWDER FEED WEIGHING UNIT	C	
376	PR.REGULATOR & SLAM SHUT VALVES	B	
377	PREDICTIVE EMISSION MONITORING SYSTEM	B	
378	PREFABRICATED INSTRUMENT HOOKUPS	C	
379	PRE-FABRICATED PIPING SPOOL	B	
380	PRESSURE GAUGES	C	
381	PRESSURE RELIEF VALVE	B	
382	PRESSURE SWITCHES	C	
383	PRESSURE VESSEL - LTCS	A	
384	PRESSURE VESSEL -CS (UPTO 50MM)	A	
385	PRESSURE VESSEL -CS (ABOVE 50MM)	A	
386	PRESSURE VESSEL-LOW ALLOY STEEL	A	
387	PRESSURE VESSEL-MONEL	A	
388	PRESSURE VESSEL-TITANIUM	A	
389	PRESSURE VESSEL-CLAD SITE FABRICATED	A	
390	PRESSURE VESSEL-CS SITE FABRICATED	A	
391	PRESSURE VESSEL-CS/LAS+SS CLAD	A	
392	PRESSURE VESSEL-LAS SITE FABRICATED	A	
393	PRESSURE VESSEL-SS (UP TO 25MM)	A	
394	PRESURE VESSEL - SS (ABOVE25MM)	A	
395	PRESSURE VESSEL-SS SITE FABRICATED	A	
396	PRESURE VESSEL LOW TEMP.3.5% NI STEEL	A	
397	PROCESS STREAM ANALYSER-ALL TYPES	B	
398	PRODUCT QUALITY ANALYSER - ALL TYPES	B	
399	PROGRAMMABLE LOGIC CONTROLLERS	B	
400	PROTECTION RELAYS	C	
401	PSA HYDROGEN PLANT	P	
402	PSA NITROGEN PLANT	P	
403	PU FOAM & POLYISOCYANURATE FOAM	C	
404	PUMP - AIR OPERATED DIAPHRAGM	B	
405	PUMP_CENT.HOR(GPP)	A	
406	PUMP-A.F.PROPELLER	A	
407	PUMP-CENT.(BFW)	A	
408	PUMP-CENT.(LOW CAPACITY HIGH HEAD)	A	

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Sr.No.	Item Description	Item Category	Remarks
409	PUMP-CENT.CAN MOTOR	A	
410	PUMP-CENT.GRAPHITE	A	
411	PUMP-CENT.H/V(FW)	A	
412	PUMP-CENT.HOR(GWS)	B	
413	PUMP-CENT.HOR(LCWS)	A	
414	PUMP-CENT.HOR(SPP)	A	
415	PUMP-CENT.HOR.(MOLTEN SULPHUR)	A	
416	PUMP-CENT.HOR.MULTI STAGE(SPP)	A	
417	PUMP-CENT.SEAL LESS	A	
418	PUMP-CENT.SU.M(CRYO)	A	
419	PUMP-CENT.VERT(GPP)	A	
420	PUMP-CENT.VERT(LCWS)	A	
421	PUMP-CENT.VERT.(GWS)	B	
422	PUMP-CENT.VERT.(MOLTEN SULPHUR)	A	
423	PUMP-CENT.VERT.BARREL TYPE(SPP)	A	
424	PUMP-RECIPRO(API 674)	A	
425	PUMP-RECIPRO(API 675,PLUNGER/DIAPHRAGM)	A	
426	PUMP-ROT.SCR.ARC(ES)	A	
427	PUMP-ROTARY(LOBE)	A	
428	PUMP-ROTARY.GEAR	A	
429	PUMP-ROTARY.SCREW	A	
430	PUMP-ROTARY.SL.VANE	A	
431	PUMP-SLURRY CENT REC.IMPELLAR	A	
432	PUMP-SLURRY.CENT(PS)	A	
433	PUMP-SLURRY.CENT.H/V	A	
434	PUMP-SLURRY.RECIPRO	A	
435	PVDF/FRP EQUIPMENTS	C	
436	QUICK OPENING CLOSURE(FILTER/SEPARATOR)	C	
437	QUICK OPENING CLOSURE(PIPELINES)	B	
438	RAIL & ROAD WEIGH BRIDGE	C	
439	REACTOR INTERNAL	B	
440	REACTOR REGENENERATOR PKG-FCC	A	
441	REACTOR/SEPARATOR- CLAD 2.25Cr 1Mo 0.25V	A	
442	REACTOR/SEPARATOR-SS CLAD 1.25 Cr 0.5 MO	A	
443	REACTOR/SEPARATOR-SS CLAD-2.25 Cr-1 Mo	A	
444	REACTOR-GLASS LINED	A	
445	RECEIVER INSTRUMENTS	C	
446	REFORMER TUBES(CENTRIFUGAL CAST)[CRACKER TUBES]	A	
447	REFRACTORY FIRE BRICKS	B	

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Sr.No.	Item Description	Item Category	Remarks
448	REFRACTORY HIGH ALUMINA BRICKS	B	
449	REFRIGERATION SYSTEM - PROCESS	P	
450	REFRIGERATION SYSTEM- VAPOUR ABSORPTION	P	
451	RELAY & CONTROL PANEL	B	
452	REMOTE CONTROLLED MONITORS	B	
453	RIM SEAL FIRE PROTECTION SYSTEM	B	
454	ROCK WOOL INSULATION PRODUCTS	B	
455	ROD MILLS	C	
456	ROTARY COOLER	C	
457	ROTARY DRILLS (BL.HOLE)	C	
458	ROTARY DRILLS (EXPLORATORY)	C	
459	ROTARY DRYER	B	
460	ROTARY KILN	B	
461	RUPTURE DISCS	C	
462	SAFETY SHOWER & EYE WASHER	C	
463	SAFETY VALVES BOILER SERVICE	B	
464	SAMPLE COOLER.	C	
465	SCADA SYSTEMS	P	
466	SCRAPER TRAP	B	
467	SCRUBBERS - SPRAY TYPE	B	
468	SCRUBBERS - VENTURI TYPE	B	
469	SECONDARY SEAL FLOATING ROOF TANK	C	
470	SEPARATOR INTERNALS	C	
471	SEPARATORS (FOR OIL FIELDS)	A	
472	SIGHT FLOW INDICATORS (SIGHT GLASSES)	C	
473	SIGNAL CABLE - FIRE RESISTANT	B	
474	SIGNAL CABLES	B	
475	SILENCER	B	
476	SILOS	B	
477	SKIN THERMOCOUPLES	B	
478	SOLAR ELECTRIC POWER SYSTEM	B	
479	SOLENOID VALVES	C	
480	SOOT BLOWER	C	
481	SPECIAL CONTROL VALVES: (ECC. DISC HI PERF, KNIFE GATE, FLUSH BOTTOM, AXIAL, BALL CONTROL, BUTTERFLY, ECC. ROTARY PLUG, LOW CV, PISTON, PLUG, SEGMENTAL, VARIABLE CV, MIXED)	B	
482	SPECIAL FLOWMETERS-SOLIDS	B	
483	SPECIAL LEVEL INSTRUMENTS (CAPACITIVE.& CONDUCTIVE TYPE)	B	

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Sr.No.	Item Description	Item Category	Remarks
484	SPECIAL LEVEL INSTRUMENTS (TUNNING FORK)	B	
485	SPECIAL LEVEL INSTRUMENTS: (RF TYPE AND GUIDED WAVE RADAR)	B	
486	SPECIAL TEMPERATURE ELEMENTS	B	
487	SPEED TANSMITTERS	C	
488	SPRAY NOZZLE- FIRE FIGHTING	C	
489	SPRAY NOZZLE-PROCESS	C	
490	SPRAY NOZZLE-TORCH OIL	C	
491	SPRING SUPPORTS	B	
492	STACK GAS ANALYSERS -ALL TYPES	B	
493	STACKER/STACKER RECLAIMER	C	
494	STATIC CONTROL SYSTEM	C	
495	STATIC MIXER	C	
496	STEAM SUPPLY / COND. RECOVERY MANIFOLD	C	
497	STEAM TRAPS	C	
498	STRAINERS	B	
499	STRAINERS (FAB/CAST/FORGED)	B	
500	STRD.PKGS.& ASSOC.INTERNALS(PROPRIETORY)	C	
501	SULPHUR PALLETIZATION PACKAGE	P	
502	SURGE RELIEF VALVE	B	
503	SWITCHBOARD FIXED FOR PACKAGE EQUIPTS	A	
504	SWITCHBOARD-EHV-GAS INSULATED	A	
505	SWITCHBOARD-HV (INDOOR) WITH VCB BREAKR	A	
506	SWITCHBOARD-HV(INDOOR) WITH SF6 BREAKER	A	
507	SWITCHBOARD-HV-GAS INSULATED	A	
508	SWITCHBOARD-M.V.-MCC/PCC/PMCC-DRAWOUT	B	
509	SWITCHBOARD-MV:MCC/ASB/LDB-FIXED TYP	B	
510	SYNCHRONOUS GENERATORS (HV)	B	
511	TANK FARM MANAGEMENT SYSTEM	P	
512	TANK LEVEL INSTRUMENT (GUIDED WAVE RADAR/ NON-CONTACT TYPE RADARS / SERVO TYPE)	B	
513	TANK LEVEL INSTRUMENT (ULTRASONIC)	B	
514	TANK LEVEL INSTRUMENTS (FLOAT OPERATED)	C	
515	TANK PR. PROTECT. DEVICES(BREATHER VALVES) / FLAME ARRESTER	C	
516	TELECOMMUNICATION SYSTEM	B	
517	TELESCOPIC ACCESS PLATFORM	C	
518	TEMP.GAUGES(BI METALLIC,FILLED SYSTEM) & THERMOWELLS	B/C	Refer Standard ITP for individual Item.
519	TEMPERATURE RECORDERS	C	
520	TEMPERATURE ELEMENTS & THERMOWELLS	B/C	Refer Standard ITP for

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Sr.No.	Item Description	Item Category	Remarks
			individual Item.
521	TERMINAL AUTOMATION SYSTEM	P	
522	TERTIARY SEPARATOR	A	
523	TEST SEPARATOR	A	
524	THERMAL FUSE	C	
525	THERMO COUPLE EXTN.CABLES	B	
526	THICKENERS & CLARIFIERS	C	
527	TOP & BOTTOM COVER REMOVAL ARRANGEMENT.	C	
528	TOWER INTERNALS (ENGINEERED BY EIL)	C	
529	TOWER INTERNALS (UNENGINEERED)	C	
530	TOWER PACKING:CARBON	C	
531	TOWER PACKING:CERAMIC	C	
532	TOWER PACKING:METALLIC(NON-PROPRIETARY)	C	
533	TOWER PACKINGS:PVC & PP(NON-PROPRIETORY)	C	
534	TOWER PCKG & ASSTD INTL:METLIC (PROPRTRY	C	
535	TOWER PKG:NON METALLIC(PROPRIETORY	C	
536	TRAILER MOUNTED FIRE FIGHTING EQUIPMENT	B	
537	TRAINING SIMULATOR SYSTEM	C	
538	TRANSDUCERS (I/P,P/I)	C	
539	TRANSFORMER-RECTIFIER UNIT FOR C.P.S.	B	
540	TRANSFORMERS: BELOW 800kVA RATING	B	
541	TRANSFORMERS INCLUDING & ABOVE800kVA RATING	A	
542	TUBE - ALUMINIUM FINNED	B	
543	TUBE COPPER AND ALLOYS	B	
544	TUBE FITTINGS	C	
545	TUBE MILLS	C	
546	TUBE-STUDDED	B	
547	TUBE-TITANIUM	B	
548	TUBE-WELDED ALLOY STEEL	B	
549	TUBE-WELDED CARBON STEEL	B	
550	TUBE-WELDED FIN	B	
551	TURBINE-GAS	A	
552	TURBINE-STEAM(GP)	B	
553	TURBINE-STEAM(SP)	B	
554	TURNKEY INSTRUMENTATION	P	
555	U.P.S.SYSTEM	B	
556	UOP JOHNSON SCREEN	C	
557	VACUUM EJECTOR CONDENSER SYS(ENGINEERED)	A	
558	VACUUM EJECTOR CONDSR SYS(UNENGINEERED)	A	

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Sr.No.	Item Description	Item Category	Remarks
559	VALVE BALL - FIRE SAFE (FORGED)	B	
560	VALVE BALL CRYOGENIC	A	
561	VALVE BALL FIRE SAFE-CCS	B	
562	VALVE BALL FIRE SAFE-CSS	B	
563	VALVE BALL JACKETED - NON FIRE SAFE	B	
564	VALVE BALL MULTIPORT NON FIRE SAFE	B	
565	VALVE BALL NON FIRE SAFE-CCS	B	
566	VALVE BALL NON FIRE SAFE-CSS	B	
567	VALVE BALL NON FIRE SAFE-FCS	B	
568	VALVE BALL NON FIRE SAFE-FSS	B	
569	VALVE BALL PIPE LINE (API6D/METAL SEAT)	B	
570	VALVE BALL PIPE LINE (API6D/SOFT SEAT)FS	B	
571	VALVE BELLOW SEALED	B	
572	VALVE- BLOWDOWN (Straight/Angle Pattern)	B	
573	VALVE BUTTERFLY - CCS	B	
574	VALVE BUTTERFLY (PTFE SEATED)	B	
575	VALVE BUTTERFLY -CAS	B	
576	VALVE BUTTERFLY -CSS	B	
577	VALVE CHECK (DUAL PLATE TYPE)	B	
578	VALVE CHECK CAST	B	
579	VALVE CHECK CRYOGENIC CAST	A	
580	VALVE CHECK CRYOGENIC FORGED	B	
581	VALVE CHECK EXCESS FLOW	B	
582	VALVE CHECK FORGED	B	
583	VALVE CHECK GUNMETAL/BRASS/BRONZE	C	
584	VALVE CUTTING	B	
585	VALVE DIAPHRAGM CAST CARBON STEEL	B	
586	VALVE DIAPHRAGM CAST STAINLESS STEEL	B	
587	VALVE DIAPHRAGM-(FOREIGN SUPPLIERS)	B	
588	VALVE DOUBLE DISC GATE	B	
589	VALVE FOOT/AIR	C	
590	VALVE GATE (MOTOR OPERATED)	A	
591	VALVE GATE (THRU CONDUIT) (AP16D)	B	
592	VALVE GATE CAST	A	
593	VALVE GATE CRYOGENIC CAST	A	
594	VALVE GATE CRYOGENIC FORGED	B	
595	VALVE GATE FORGED	B	
596	VALVE GATE GUNMETAL/BRASS/BRONZE	C	
597	VALVE GLOBE CAST	B	
598	VALVE GLOBE CRYOGENIC CAST	B	

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Sr.No.	Item Description	Item Category	Remarks
599	VALVE GLOBE CRYOGENIC FORGED	B	
600	VALVE GLOBE FORGED	B	
601	VALVE GLOBE GUNMETAL/BRASS/BRONZE	C	
602	VALVE KNIFE GATE	B	
603	VALVE NEEDLE	C	
604	VALVE PISTON (GLANDLESS)	B	
605	VALVE PLUG CONCENTRIC- CCS (F.S & N.F.S)	B	
606	VALVE PLUG CONCENTRIC -CSS (F.S & N.F.S)	B	
607	VALVE PLUG CONCENTRIC-CAS(F.S. & N.F.S.)	B	
608	VALVE PLUG DBB EXPANDING TYPE	B	
609	VALVE PLUG MULTIPORT - NON FIRE SAFE	B	
610	VALVE PLUG PRESSURE BALANCED (FS)	B	
611	VALVE PLUG PRESSURE BALANCED (NFS)	B	
612	VALVE PLUG-(FOREIGN SUPPLIERS)	B	
613	VALVE SHUT DOWN	B	
614	VALVE SLIDE	B	
615	VALVE SPECIAL CATEGORY	A	
616	VALVE TANK BOTTOM/FLUSH BOTTOM	B	
617	VALVE-BUTTERFLY (TRIPLE OFFSET)	B	
618	VALVE-DUPLEX / SUPER DUPLEX SS	A	
619	VALVE-NON SLAM CHECK (NOZZLE)	B	
620	VAPOUR RECOVERY SYSTEM	C	
621	VAPOUR SEAL CHAMBER	C	
622	VENTILATION & PRESSURISATION SYSTEM	P	
623	VIBRATING SCREEN	C	
624	VIBRATORY FEEDER	C	
625	VISCOSITY METER	C	
626	VPSA OXYGEN PLANT	A	
627	WASTE HEAT RECOVERY SYSTEM	P	
628	WATER CUM FOAM MONITOR	C	
629	WATER MONITOR	C	
630	WATER QUALITY ANALYSERS- ALL TYPES	B	
631	WATER SPRINKLER	C	
632	WELDOLETS/SOCKOLETS/ELBOWLET	B	
633	WIRELESS TETRA COMMUNICATION SYSTEM	B	
634	WOBBE METERS	B	
635	Y TYPE GLOBE & STOP CHECK VALVES	A	
636	YY-GROUP COMPANIES	C	

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Notes:

1. Though the stage Inspection by EIL has not been envisaged for Category 'B' items, EIL reserves the rights to witness inspection of any stage which shall be decided during ICP/QAP approval stage based on the process criticality and the contract between Owner and EIL.
2. Items not covered in Table-1 of Doc. No. B957-8-1842-0004 shall also be categorized in consultation with Owner / EIL.
3. For Category 'P' items, Package supplier shall submit Final Documents on completion of scope of works or as defined in PO/PR.
4. Flanges, tube sheets, non-standard forgings, forged fittings and Orifice plates/forgings (CS, LAS, SS) of rating 1500# & above shall be considered as 'category-A' item.
5. All types of valves of pressure class 1500# & above shall be considered as 'category-A' items.
6. RTJ-octagonal and 1500# & above ratings gaskets shall be considered as 'category-B' items.

Notwithstanding the above, EIL / Owner reserves the right to participate in any stage / final inspection

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PROCEDURE FOR SMART INTEGRATED ENGG., DIGITAL HANDOVER OF DRAWING/DOCUMENT/ 3D MODEL AND DIGITAL INTERVENTION BY BIDDER

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT, BPREP

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED.

CONSULTANT : M/s ENGINEERS INDIA LTD.

JOB NO. : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
D	15/05/2025	REVISED AND REISSUED FOR ENGINEERING	MS	MK/KB	SV
C	08/03/2025	REVISED AND REISSUED FOR ENGINEERING	MS	MK/KB	SV
B	04/02/2025	REVISED AND REISSUED FOR ENGINEERING	MS	MK/KB	SV
A	26/11/2024	ISSUED FOR ENGINEERING	MS	MK	SV

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1. GENERAL

This chapter details the requirements pertaining to various drawings, documents and 3D model to be generated at various stages during the course of execution of the project by the Bidder(contractor/vendor/supplier) for activities associated with Smart Integrated engineering and digital handover. These stipulations are supplementary to following specifications (enclosed elsewhere in the contract):

S. No.	Spec. No.	Specification detail
1.	6-78-0001	Specification for quality management system requirements from bidders
2.	6-78-0002	Specification for documentation requirements from contractors
3.	6-78-0003	Specification for documentation requirements from suppliers

The Bidder shall recognize that efficient handling of drawings and documents to be prepared by him under the contract is the key to the timely completion of the plant.

The Bidder shall ensure that all drawings and documents to be submitted by him to the OWNER/CONSULTANT shall be of professional quality and conforming to the contractual requirements.

The Bidder shall submit the drawings through the defined document management system for the project for review by OWNER /CONSULTANT, and shall maintain a record of drawings submitted till date at all times. Access to document management system shall be provided by client/consultant to the successful bidder which shall be utilized by the bidder for their smart engineering activities without any deviation.

Compliance of this chapter on drawings and documents is mandatory and is non-negotiable.

A pre-defined document numbering philosophy will be provided to successful bidder which shall be adopted and implemented by bidder for documents generated for this project.

Computer aided design and drafting shall only be used. Standard, approved and well-established PC based computer programs/software packages, available in market shall only be used by the Bidder and its sub-vendors etc.

All documents, before forwarding to OWNER /CONSULTANT shall be vetted in detail by Bidder. Documents received without vetting will be returned without review. Also, any in accuracies/mistakes found will not only be rectified by the BIDDER but the BIDDER shall remain liable for bearing charges towards efforts spent by OWNER/CONSULTANT for discussing the same. Delay owing to these shall be to the account of BIDDER.

Review of the drawings/documents by OWNER/CONSULTANT would be only limited to the review of compatibility with basic designs and concepts. The review by the OWNER/CONSULTANT shall not be construed by the BIDDER as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

All drawings, datasheets, specification & model etc. shall be generated by the use of authoring tools specified elsewhere in the contract document. The digital handover shall be in soft native files along with associated database.

BIDDER shall furnish 3D model~~ing~~ (with complete details with respect to equipment, Piping, Civil, Structure, Electrical & Instrumentation in line with scope of work for 3D

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modeling) of plant with dynamic walk-through facility to check any interference, requirement of safety, operation and maintenance for getting approval from OWNER/CONSULTANT with input data. Associated data base files along with library shall also be furnished at 30%, 60% and 90% model reviews.

Each drawing submitted by the BIDDER shall be clearly marked with the name of the Owner, the unit designation, the specifications, title, the specification number and the name of the Project with revision No. and date. If standard catalogue pages are submitted the applicable items shall be indicated there in. All titles, notings, markings and writings on the drawings shall be in English. The template shall be approved by the consultant/client. All documents shall be prepared on the approved template.

All the Engineering design and specifications shall be normally prepared in MKS system excepting for Civil/Structural wherein, the SI system is in vogue based on applicable design codes. Upon receiving comments on Drawings/Documents, the BIDDER shall provide compliance report/comment resolution sheet, separately on each of the comments, document-wise, along with the subsequent submission. Comments given by OWNER/CONSULTANT shall be discussed, if required, and finalized within the agreed schedule.

The schedule of submission of Drawings/Documents shall be in accordance with project plans only. The detailed list under different category, document-wise, shall be prepared by BIDDER for review/records of OWNER/CONSULTANT.

The BIDDER shall maintain up-to-date record of drawings & document status and make regular issue of drawing/documents index **discipline wise, on monthly basis, with copies to OWNER /CONSULTANT Site &, H.O.** indicating schedule date of submission, submission date of various revisions and date of review with code of review/ approval.

2. Category of Documents and Cycle Time

The handling of documents by OWNER/CONSULTANT /BIDDER shall be as follows:

2.1 OWNER /CONSULTANT's Review/Records

A detailed document list clearly identifying review/records category against each document shall be developed. Following may please be noted for all the documents engineered by the BIDDER:

a) Review

BIDDER can proceed if OWNER/CONSULTANT's comments are not received within 10 working days of its receipt by OWNER /CONSULTANT. However, if major deviation to contract specification for any design deficiency is detected in the course of review after stipulated period, it shall be the responsibility of the Bidder to see that such deviations and deficiencies are corrected to ensure compliance to contract without any cost and time implication to Owner.

b) Records

BIDDER shall submit documents for OWNER/CONSULTANT's information and proceed with the work. OWNER/CONSULTANT comments, If any, which relates any cost and/or time implication to the owner due to inadequacies/inaccuracies may be brought to the attention of BIDDER at any stage for incorporation without any cost or time impact to owner.

The documents falling under review category shall in general, except for drawings requiring multi-disciplinary review, be returned with comments within 10 working days.

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Documents submitted without meeting pre-requisite requirements will be returned without review.

However, documents like equipment layout etc. where multi-disciplinary activity is involved, the BIDDER, after submission for OWNER/CONSULTANT's review, shall visit OWNER/CONSULTANT for discussion for expeditious review of documents.

In absence of visit of BIDDER'S engineering team at OWNER/CONSULTANT office, review time shall be 15 working days. The information category document will be retained for records only. It is BIDDER'S responsibility to correct the deviation, if any, to the stipulation in the bid document, without any cost or time implication to Owner.

2.2 BIDDER'S Review

BIDDER shall furnish compliance statement to OWNER /CONSULTANT's comments while submitting the next revision within 10 days from the date of release of drawings and documents by OWNER/CONSULTANT.

2.3 Control and Monitoring of documents review and submission

Drawing schedule shall indicate the following:

- Schedule/Actual submission date to owner
- Category of submission
- Receipt of comments from Owner
- Category of return status from Owner
- Issue date for Construction

This updated schedule shall be issued on fortnightly/monthly basis, as agreed, and compared with Owner's log.

Detailed listing of documents (discipline wise) which are scheduled to be submitted or re-submitted incorporating OWNER/CONSULTANT's comments shall be provided by BIDDER in the weekly meetings. Bidder shall ensure that drawings /documents are submitted as per the agreed schedule only. Bunching of documents/out of sequence submissions and consequential delay of documents and its review thereof shall be exclusively attributable to BIDDER.

2.4 Pre-Requisites from Bidder

2.4.1 At the kick-off meeting, the BIDDER must submit discipline wise list of documents and drawings index.

2.4.2 The Drawing Index (discipline wise) shall include description of drawings/ documents, category of drawings, scheduled date of submission, actual date of submission, review code received with dates. This shall be updated fortnightly/monthly, as agreed by BIDDER and copies issued to OWNER /CONSULTANT site and H.O. as well as Owner. Drawings submitted before finalization of drawing index shall be rejected.

2.4.3 BIDDER shall separately submit list of drawings/documents involving multi- disciplinary reviews, considering the OWNER /CONSULTANT departmental activities (furnished in the contract) during the kick off meeting itself. They are also highlighted in the discipline- wise document list.

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2.4.4 Critical and typical drawings/documents having impact on schedule and quality should only be identified for such timely reviews in Document Control Index. This shall be adopted after receipt of drawings/documents indexes from the BIDDER at the kick-off meeting with mutual understanding of the BIDDER/concerned specialist/Owner.

2.4.5 Any deviation on Record category drawings/documents and on review category drawings observed later or in execution at site during site visit/technical review by OWNER/CONSULTANT shall be taken seriously. Bidder shall rectify the same at his own cost and time.

2.4.6 BIDDER shall plan submission progressively so that no bunching takes place in any discipline.

2.4.7 Review period shall be reckoned from the "Date of Receipt" of documents/drawings at OWNER /CONSULTANT to the "Date of Receiving" the reviewed documents by the BIDDER from OWNER /CONSULTANT office. BIDDER shall monitor submission and receipt.

2.4.8 Documents/drawings received prior to holiday/week end shall be accounted as received on the following working day and the review period committed shall include only working days.

2.4.9 Quality of drawings/documents is the essence for a timely review. If major comments/deviations to the contract document are noticed, the drawing shall be returned in Code-3.

2.4.10 Sequence of submission of drawings is essential for proper review of documents and timely completion of the project and the same is to be adhered to. In case sequence is not maintained, the documents submitted shall not be reviewed by OWNER/CONSULTANT and the responsibility of timely execution of the plant shall remain with BIDDER.

2.4.11 Piping/Instrument & other engineering drawings/documents shall be issued only after the corresponding P&IDs& Process documents coming under review category are first reviewed by the concerned department in code-2 as a minimum.

2.4.12 In principle. BIDDER is not expected to revise drawings/documents already reviewed in Code-1.

a) If it is of utmost necessity to revise or add some minor details in Code-1 drawings, BIDDER shall highlight such revisions by marking "CLOUD" and providing appropriate revision nos. to such additions/alterations. BIDDER is also needed to provide a "BLOCK" in the drawing indicating reasons of such changes and to insert another "Review Block". OWNER /CONSULTANT shall put relevant code for such revisions only. Code marking given by OWNER /CONSULTANT on such revisions shall not change the category of drawing.

b) Any major change in Code-1 drawing shall call for preparation of new drawing.

2.4.13 Based on the confidence gained on BIDDER'S quality of drawings/documents already submitted, "Review Category" drawings could be retained as Information/Records and vice versa at the discretion of OWNER/CONSULTANT. This however, does not change the category of drawings.

2.4.14 Once a document is already reviewed in Code-2, subsequent submission due to non-incorporation of comments shall not be accounted for any contractual commitment of review period from OWNER /CONSULTANT. BIDDER is expected to comply with OWNER

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/CONSULTANT's comments in the next revision after Code-2 and is required to submit a compliance report accordingly

2.4.15 Deviation permit, submitted for seeking deviation in vendor document management system, shall be separately identified and shall not be considered as a document for timely approval/review.

2.4.16 When OWNER/CONSULTANT deploys engineers at the BIDDER'S work center following shall be satisfied:

- Review is limited to identified long delivery/schedule critical items only.
- Readiness of documents/drawings shall be ensured by the BIDDER.
- Presence of lead engineers of all disciplines of the BIDDER.

2.4.17 If OWNER/CONSULTANT highlights any necessary rectifications required in the construction at the time of Technical Review/Audit, construction executed based on record category drawings not complying with Bid requirement, BIDDER shall rectify without any impact of time and cost to Owner.

2.4.18 BIDDER shall submit designs drawings for review only after the corresponding GA/Equipment datasheets etc. have been coordinated in his office and reviewed by OWNER/CONSULTANT engineers at least in Code-2. Such OWNER/CONSULTANT reviewed drawings shall be furnished along with drawings/designs for timely review.

2.4.19 BIDDER shall open an engineering office in India for speedy document submission and to help faster review of the drawings & documents.

2.5 Approved for Construction Drawings

Drawings reviewed under Code1 & Code2 required for execution at site shall be decided by BIDDER and copies need to be sent to OWNER /CONSULTANT (RCM), BIDDER'S RCM and BPREP (site).

- "**Approved for Construction**" stamped/sticker drawings shall be issued by BIDDER for execution.

- "**Approved for Construction"** stamped/sticker shall be done separately on the reviewed print and not on the Title block.

-Without changing Revision **Number**, BIDDER to arrange adequate number of prints of documents and drawings to BIDDER'S RCM, OWNER/CONSULTANT RCM and BPREP (site) with transmittal.

- Copies of only reviewed or final documents like design calculations, design basis etc. shall be sent to OWNER /CONSULTANT site for records.

- Copy of such transmittal shall be sent to OWNER /CONSULTANT (HO) & BPREP (HO) for records.

2.6 Critical Drawing/documents shall be reviewed by Licensor during the course of Project execution, list of Licensor mandatory review document is enclosed elsewhere in the contract.

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2.7 Mandatory compliance to the smart engineering activities at Bidder's end

2.7.1 Plant Breakdown Structure (PBS) supplied by EIL to be adhered to. The SEED file and Plant Breakdown Structure (PBS) shall be provided by consultant to the successful bidder which shall be utilized by the bidder for their smart integrated engineering activities without any deviation.
For any deviation in this regard prior approval need to be taken by Bidder from EIL.

2.7.2 For residual engineering (process), work share to be followed. In case any new symbol is required, same shall be obtained from/ authorized by EIL.

2.7.3 All P&IDs need to be smartly developed. All the constituents of P&ID need to be intelligently mapped with database/database driven. There shall not be any graphics/symbols/texts in the smart P&IDs. There shall not be any dummy graphics/symbols/texts in main body of the P&ID.

2.7.4 3D Modeling for Piping, Equipment, Instruments & Electrical need to be database driven. Dummy graphics need to be avoided. Quality check & data connectivity shall be ensured at Bidder's end before submitting the data files/documents/3D Model to the Consultant.

2.7.5 All the applicable deliverables shall be extracted from 3D model without any manual rework done thereafter. This is to maintain the consistency between 3D model and extracted deliverables.

2.7.6 Deliverables from 3D model shall be extracted only on conforming the alignment of interfaces with client model and clash free design.

2.7.8 For consolidation of engineering data, critical attribute metadata excel file to be filled and submitted by vendor. Template will be provided during detailed engineering.

2.8 Digital handover of Engineering Information

Smart Integrated engineering shall be utilized to carry out engineering activities. Intelligent Systems shall be used for the management of P&ID, Equipment layout, 3D Model, Piping, Electrical and Instrumentation design & deliverables including P&IDs, Reports, MTO, procurement etc.

The data in each such intelligent system, including the 3D Model and Intelligent P&ID's to be submitted by the Bidder in a predefined Software version/format, as tabulated below. The same shall be submitted by the respective LSTK vendor/equipment suppliers strictly without any deviation.

Software versions/Format Requirements

The definition is in general terms containing (native (N), image (I), portable document format (D)) the formats in which Bidder shall provide electronic versions of Documents. Acceptable applications for each format type are listed in the table below.

Data/Document Types	Authoring Software*	Version

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2D CAD	S3D, AutoCAD	*/2018
Intelligent P&IDs	SPID	*
Instt. Index, Datasheet etc	SI	*
Electrical load list/Single line diagram/Interconnection details/Cable Schedule	SEL	*
3D Model	S3D#	*
2D Documents from the 3D model	S3D#	*
Text Documents/Reports	MS Word 2013 or as agreed with Company	*
Datasheets/Lists	MS Excel 2013 or Adobe Acrobat as agreed with Company	*
Email	Rich Text Format	
Schedules	Primavera	*
Organization Charts/diagrams	Visio 2013, Microsoft power point or as agreed with Company	
Portable Document Format Files	PDF files shall always be directly generate PDF from the authoring application. Scanned documents/Images which are converted to Adobe Acrobat format do not qualify as Portable Document Format files and shall be treated as image files for the purpose of format compliance.	

*Version shall be finalized during KOM.

In case documentation submitted is of authoring software mentioned below, the data has to be submitted comprehensively including native files, databases, catalogs etc., as detailed here.

SMART 3D#	Project DBs in oracle/sql** (version shall be compatible with latest version of SMART 3D) along with Reference project for Catalogues, Standards, customization develop for the job etc.
INTERGRAPH SMART P&ID	SPID Project Backup along with deliverables extracted from SPID (P&ID, PDS, Line list) and database in oracle/sql** (version shall be compatible with latest version of SMART PID)
AUTOCAD	DWG/DXF files
SMART Instrumentation	SPI Project Backup (DWG + Datasheets + Tags & Attributes in excel format) and database in oracle/sql** (version shall be compatible with latest version of SMART Instrumentation)

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SMART Electrical	SE Project Backup (DWG + Tags & Attributes in excel format) and database in oracle/sql** (version shall be compatible with latest version of SMART Electrical)

**Database (oracle/sql) and Version shall be finalized during KOM.

It is suggestive to use the defined 3D modelling platform for seamless integration and data exchange with smart authoring tools (SPID, SPI & SEL) and further downstream correlation with defined document management system for smart engineering and digital handover. However, if EPC Contractor choose to use any other 3D modelling software, they can do so but they need to ensure and demonstrate the capabilities (within 45 days after Kick off meeting) of converting their model into S3D format, fulfilling below project requirements, before starting the modelling activities.

- Following same PBS as being defined by consultant.
- 3D model capable of generating isometrics, GAD, MTO etc, shall have consistent and correlated data with other smart authoring tools of P&ID, instrumentation and electrical design.
- The converted 3D model data shall also be consolidated and correlated with data and document in client document management system and thus there should not be any lack of features/ data output in the converted model with respect to the model being made in S3D originally.
- Any other functionality as required.

Approval for initiation of modelling activities will be provided once the above-mentioned capabilities is fulfilled and successfully demonstrated to Consultant/Client. Also, when bidder is delivering the 3D model at any stage of the project, they have to convert all the files/database etc. to S3D format meeting above stated requirement. Validation and correctness of converted model shall be ensured by bidder before submitting the model to consultant/client.

No model review shall be done without submission of 3D model file/database in S3D format and subsequent acceptance by consultant/client.

2.9 Real Time Tracking of Major Shipments for BPREP Project and Data Sharing for Use on BPREP Control Tower

2.9.1 General Requirements

The Bidder (Vendor/ Contractor) (directly and/or through their transport agency) shall provide real- time tracking information for all consignments as per the following:

1. Tracking information of all shipments through all modes of transport vs. Air, Land and Sea
2. GPS tracking for all shipments exceeding INR 10 lakhs in value
3. Electronic sharing of GPS tracking data (as applicable) and consignment tracking data (through Transport Agency's Transport Management System) via REST API

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and on web portal of bidder or transport agency, including depiction of location of consignments on map where GPS tracking is applicable

4. Tracking details for both international and domestic shipments.

For International Shipments mandatory vessel tracking through AIS (Automatic Identification System)

2.9.2 Mandatory Tracking Information

The Bidder must provide the following information for each consignment:

1. Unique consignment identifier
2. Real-time GPS coordinates for in-transit shipments
3. Scheduled, Estimated and actual departure times from point of origin
4. Scheduled, Estimated and actual arrival times at destination
5. Current location and status updates on a daily basis (GPS Status updates shall be live)
6. Total Distance, Cumulative Actual Distance Travelled, Daily Distance Travelled to be updated on Daily basis.
7. Any deviation from planned route or schedule
8. Detailed consignment route details with GPS coordinates for key touchpoints like ports, terminals and warehouses.

2.9.3 Data Sharing Protocol

The Bidder shall:

1. Provide access credentials for their tracking platform as applicable
2. Share tracking data in real-time for GPS tracking and daily basis
3. Provide notification of any tracking system failures/ downtime or data gaps

2.9.4 Security and Confidentiality

1. All tracking data shall be treated as confidential information
2. Data transmission must use secure protocols
3. Bidder shall comply with relevant data protection regulations

3.0 Project Monitoring and Reporting for BPREP Project and Data Sharing for Use on BPREP Control Tower

3.0.1 Client is deploying a Project Monitoring System and Control Tower for the project. The bidder shall have the following obligations wrt Project Planning, Scheduling and Monitoring. This will be read in conjunction with project management clauses specified elsewhere in the Tender/MR.

3.0.2 The bidder shall submit a comprehensive monthly progress report via the PMIS, which will include the following:

1. Executive Summary: A high-level overview of the reporting period's progress, summarizing key accomplishments and major issues encountered.

2. Progress Monitoring: Progress Monitoring/ Earned Value Management (Planned vs Actual) at project and Functional Level based on underling Deliverable List/DCI, Sub-ordering/ Material Control Index (MCI), Manufacturing Milestones and actual progress against planned schedules.

3. Project Schedule: Bidder shall submit the Critical Path Method Schedule (CPM) Project Scheule in Primavera P6 or MS Project Format on a monthly basis.

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4. Areas of Concern: A detailed description of any issues or risks impacting project timelines, Engineering, Manufacturing, or Sub-ordering activities. The bidder must identify bottlenecks, supply chain delays, and potential risks that may affect overall project progress.
5. Engineering Status: Detailed progress reports on engineering tasks, including design, technical drawings, and any engineering-related milestones, document approval status, pending approvals, revisions, or rejections etc. Any delays or issues affecting these deliverables must be clearly reported. EIL VDMS data shall may be available to bidder for reference.
6. Sub-ordering Status (MCI): A summary of all sub-ordering activities, including key milestones, supplier performance, and delivery timelines. Any delays or issues affecting suborders must be clearly outlined.
7. Manufacturing Status: A detailed update on the manufacturing process, including the production schedule, quality checks, and any deviations from planned timelines.
8. Dispatch Status: Detailed status of items dispatched, Packing Lists, LR Details, Transporter Details, Tracking Details etc.

3.0.3 Data Integration: The bidder shall ensure that all required data, including schedules, deliverables, and KPI inputs, are entered (manual entry, predefined templates) accurately into the PMIS system. Bidder will be provided access to the PMIS System. The bidder is responsible for ensuring data integrity and timely submission.

3.0.4 Compliance with Workflows: The bidder must adhere to the defined workflows in the PMIS system for report submission, review, and approval. The bidder's reports will undergo review at multiple levels and the bidder shall address any feedback or corrections promptly.

3.0.5 Earned Value Management (EVM): The bidder is responsible for providing inputs that align with the Earned Value Management methodology, including schedule and cost data, weighted WBS, and progress updates, which contribute to the generation of project S-curves and EVM reports.

3.0.6 The reports will be submitted in PMIS predefined templates, reviewed through the PMIS workflows, and updated in the system on a monthly basis. The bidder shall ensure all data is accurate and up to date to allow for timely review and integration into the overall project progress monitoring system.

3.0.7 Failure to provide data/ info on timely basis may be considered a breach of contract.

3.0.8 Contractor shall comply with cybersecurity guidelines/advisories/acceptable use policy issued by BPCL/EIL.

3.0.9 In case, any of the systems are not deployed, or are stopped during the course of the contract; executing, reporting and monitoring of the work will continue through traditional methods, other platforms as directed by the Engineer-in-Charge.

3.0.10 Non availability of platforms will not be a reason for seeking time extension, change orders pertaining to time and/ or cost.

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4.0 DIGITAL QUALITY INSPECTION SYSTEM (DQIS).

D

4.0.1 System Overview

Purchaser intends to deploy a Digital Quality Inspection System for quality inspection for status monitoring, recording and storing digital copy of quality inspection records for inspections at Vendor Shops, Fabrication Yards and Construction site. All quality inspection process is expected to be integrated to DQIS. DQIS shall have provision for stagewise inspection activities for Shop Inspection. Project Progress reports (PMIS) shall also be linked to DQIS.

DQIS shall have inbuilt user help features, offline working capabilities on the mobile devices/ smart phones and Dashboards for status monitoring.

DQIS shall be accessed through browser-based interface on laptops, tablets and mobiles. A Mobile App shall also be provided for user access from smart phones (Android™ 11 or later versions and IOS).

4.0.2 Bidders Obligations:

1. Bidder shall be responsible for providing data, observations, deviations, annotations, submitting resolutions (as applicable) duly endorsed by EIL to prepopulate dropdown lists for the forms defined in DQIS in line with bidders' scope and ITP's. The bidder will be required to upload the detail inspection reports, backup documents and photograph(s) taken during inspection through EIL EPS portal for reflection in relevant forms of DQIS. Bidder may also be required to provide other information like dispatch details, URL's for consignment tracking, etc. in EPS Portal.

2. Detailed DQIS workflows shall be furnished at a later date. Bidder shall comply with the workflows defined in the DQIS broadly covering the shop inspection including raising inspection calls, conducting inspection, raising queries/ observations/ comments, submitting resolution to PMC/ MPMC/ Consultant/ Client/ comments/ issues, etc.

3. Bidder and its supervisory personnel shall actively monitor dashboards and reports generated by DQIS to track unresolved issues and compliance trends, ensuring timely compliance.

4. Bidder shall coordinate with all stakeholders as necessary for timely and effective execution of inspections of the project through DQIS.

5. Bidder shall use the DQIS training resources/manuals, etc. available online to understand and achieve proficiency in use of the system.

6. Bidder shall comply with the DQIS data security protocols and ensure that only authorized personnel access the system using approved devices.

7. Bidder shall ensure their personnel are equipped with laptops/ tablets/ smartphones (AndroidTM 11 or later) for use of the DQIS System. User/ Role based access to the system shall be provided.

8. In case the DQIS is dysfunctional or is withdrawn during the course of execution of the contract, bidder shall follow the manual paper/ email-based Quality Templates as defined in the relevant specifications or any other equivalent system based on directions of Engineer-in-Charge.

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JOB SPECIFICATION
FOR
INSULATION OF ELECTRICAL HEAT TRACED PIPING
(SMMS)

PROJECT : PMC SERVICES FOR POLYPROPYLENE UNIT & BUTENE-1 OF BINA PETCHEM & REFINERY EXPANTION PROJECT, (BPREP)

OWNER : M/s BHARAT PETROLEUM COOPERATION LIMITED

PMC : ENGINEERS INDIA LIMITED

JOB NO. : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	25/11/2024	ISSUED FOR TENDER	VT	PP	PS

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1.0 GENERAL

1.1 Scope

The specification highlights the requirements for the supply, design, installation, quality control of insulation to be applied on above ground electrically heat traced piping for Bina Petchem and Refinery Expansion Project (BPREP) of Bharat Petroleum Corporation Limited.

Based on the general layout arrangement drawing, datasheet, line schedule and technical requirement specified/ appended elsewhere in the tender, the contractor shall prepare detail insulation drawings and method statement for application & quality control for insulation which shall be reviewed/ approved by EIL/ BPCL. The contractor shall supply insulation & ancillary materials and carry out application as per approved drawings and procedures.

1.2 Reference codes and standards

The following standard shall, to the extent specified herein, form a part of this specification. Where a specific edition date is not indicated, it shall be taken that the most current edition (including addenda) in effect at the time of contractor's proposal submittal shall apply.

ASTM Standards

ASTM C591	Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C871	Standard test method for chemical analysis of thermal insulation materials for leachable chlorides, flourides , silicate and sodium ions.
ASTM C303	Test Method for Dimensions and Density of Preformed Block and Board−Type Thermal Insulation
ASTM D6226	Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Material
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials
ASTM C177	Standard Test Method for steady-state heat flux measurement and thermal transmission properties by means of the guarded-hot plate apparatus
ASTM C592	Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM C1729	Standard Specification for Aluminium Jacketing for Insulation
ASTM C167	Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

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ASTM C518	Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

IS Standard and Specification

IS 8183	Bonded mineral wool specification

Steel Structure Painting Council Standard

SSPC-SP-6	Steel Structure Painting Council Standard for surface preparation

1.3 Specific abbreviations

Term	Definition
MOC	Material of Construction
GA	General Arrangement
ITP	Inspection & test plan
QAP	Quality Assurance Plan
BD	Bulk density
PUF	Polyurethane Foam
MTC	Material Test Certificate

1.4 Document precedence

In the event of conflicting requirements noticed, the contractor shall notify BPCL/ PMC and obtain resolution before proceeding. The order of precedence shall be

a) This specification
b) Engineering design basis given in tender
c) Industry codes and standards
d) Application procedure/ quality plan prepared by EPC contractor

2.0 INSULATION DESIGN

2.1 Insulation system and thickness

Insulation system for the electrically heat traced piping shall be pre formed segment of PIR with an inner layer of rockwool and outer layer vapour/moisture barrier over PIR, followed by aluminium cladding as weather barrier.

The outer layer vapour barrier/ moisture barrier shall only be considered where ever the operating temperature is less than 175°C.

Contractor to ensure that the insulation system using these materials shall maintain an operating temperature as mentioned in process datasheet/ line schedule in the piping while in operation. Thickness of respective insulation shall be as per the applicable datasheet/ thickness chart/ line schedule appended elsewhere in the tender.

Generally, for all traced piping a heat container is created with aluminium foil having thickness 0.1-0.15mm applied over piping prior to installation of insulation over traced piping. The requirement of heat container shall be verified from electrical heat tracing manufacturer and same shall be considered.

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2.2 Extent of Insulation

Insulated piping shall have straight pipe, bends, tees and pipe-fittings completely insulated. All valves and flanged joints if any, shall be completely insulated in lines which are trace heated to maintain temperatures.
Heat traced instrumentation if any shall be insulated. The fluid containing sections of such instruments and the associated piping shall be completely insulated.

2.3 Corrosion Prevention

External surface of the piping shall have a suitable under insulation painting for the purpose of corrosion protection. The type of coating (primer & final paint) with respect to temperature and DFT shall be as per the applicable coating specification for the project.

3.0 MATERIALS

3.1 Insulation Materials

All insulation and ancillary materials shall be new, dry. Insulation materials shall be of low chloride content, chemically inert, non-sulfurous, rot proof, vermin proof, non-injurious to health and non-corrosive to steel (even if soaked in water at ambient temperatures for extended periods), shall not disintegrate, settle, change its form of composition, in a detrimental way during service conditions. Typical details/ minimum technical specification of the major insulation materials and accessories are given in this specification as a guideline.

3.2 Preformed Polyisocyanurate Foam (PIR)

The PIR rigid foam shall be prefabricated from free rise buns made from HCFC free chemicals. The material in general shall conform to ASTM classification C591 Grade-2, Type-II. The buns shall be made in continuous production and then machine cut into pipe sections using a CNC machine. Pipe section shall be of two halves for pipe dia. upto 12 inch, beyond which 3,4 or more segments limited to maximum 6 as necessary as per curvature of the surface shall be fabricated, moulded pipe sections made from chemicals in batch process is not acceptable.

Characteristics	Value	Remarks
Temperature range of use	(-) 200 to (+) 120 ^{0}C	
Bulk density (kg/m^3) ASTM-C302/ ASTM -D1622	40 min	Batch test *(Note-1)*
Closed Cell content (%) ASTM D-6226 Procedure-2	95 min	
Chloride content (ppm) ASTM C 871, Procedure 2	60 max	
pH (ASTM C 871)	6-7	
Water vapour transmission (ng/Pa-s-m) ASTM E-96 method-A at 23°C & 50% RH	5.1 max	
Compressive strength at 10% deformation (kPa), ASTM D 1621	240 min.	
Thermal conductivity of 180 days aged sample at (+)10 deg C mean temp (W/mK) , ASTM C-177	0.026 max	
Flame spread Index (ASTM E84)	25 max	Type test *(Note-2)*

Note-1: Supplier shall provide test certificate for each production Batch.

Note-2: Type test certificate no older than 2 years from date of issuance of PO shall be acceptable

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3.3 Rock wool

Rock wool is a fibrous insulation made from molten rock, bonded with resin or suitable binder. The term rock wool shall mean fibrous insulation wool made from natural rock and does not refer to products manufactured from slag or glass. For application over austenitic stainless steel, the material shall be zinc free and shall be inhibited with sodium silicate as per ASTM C-795.

3.3.1 The material may be used up to 550^{0}C, but shall meet the general classification of respective standards and service temperature requirements as mentioned below:

Form of Fibrous Material	Quality standard	Max service temperature
Preformed pipe sections	ASTM C547 / IS 9842	760^{0}C
Insulation blanket with wire net facing	ASTM C592 / IS 8183	649^{0}C

Rock wool shall meet following minimum properties:

Characteristics		Material type	
		Pipe sections	Blanket
Service temperature (°C)		650	650
Nominal Density (kg/m^3), in acc. with ASTM C302 (pipe) / ASTM C303 (Slab)/ASTM C167 (blankets)/IS 8183/IS 3144		140	128
Linear Shrinkage (%) at 550°C/ 24 hours as per ASTM-C-356, max.		2	2
Non fibrous shot (%) as per ASTM C-1335		15	15
Water vapor sorption (%) as per ASTM C1104, max.		5	5
Alkalinity, pH as per ASTM C-871		7-10	7-10
Leachable Chloride as per ASTM C-871, ppm, max.		10 (Note-1,2)	10 (Note-1,2)
Test for incombustibility OR fire resistivity	Incombustibility as per 8183/IS 3144	Pass	Pass
	OR Flame spread as per ASTM E84	25	25
Thermal Conductivity (W/mK), IS 3346 /ASTM C177/ASTM C-518 at mean temperature, max.	(+) 100°C	0.052	0.052
	(+) 200°C	0.070	0.068
	(+) 250°C	0.085	0.080
	(+) 300°C	0.10	0.090
Note-1: Max. 20 ppm allowed for application over carbon steel and low alloy steel Note-2: Type test certificate no older than 2 years from date of issuance of PO shall be acceptable			

3.3.2 Forms of rock wool insulation

Nominal pipe diameter	Form of Fibrous Material
Up to 6 inch	Preformed pipe section is mandatory
> 6 inch to 14 inch	Preformed pipe section is desirable
>14 inch	Insulation blanket with wire net facing

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3.3.3 For operating temperature up to 175°C for application over carbon steel and low alloy steel pipe, insulation blanket wherever used shall have GI metal facing on one side with hexagonal shaped (25mm) wire-woven netting (0.88 to 0.73mm dia.) stitched with tie wires (0.41mm dia.). Galvanization shall be minimum 30gsm.

3.3.4 For operating temperature 176°C and above, for application over carbon steel and low alloy steel pipe, insulation blanket wherever used shall have metal facing as per ASTM A167 type SS 304 with 25mm mesh and 0.8mm wire diameter, stitched with 0.41mm dia. tie wires.

3.3.5 For austenitic stainless steel and alloy 20 piping, irrespective of operating temperature, insulation blanket wherever used shall have metal facing as per ASTM A167 type SS 304 with 25mm mesh and 0.8mm wire diameter, stitched with 0.41mm dia. tie wires

3.4 Weather Protection Jacket (Cladding)

Unless otherwise mentioned, aluminium jacketing shall be used as weather protection over insulation up to operating temperature 550°C. Aluminium cladding shall be as per ASTM C1729, Class-A having polysurlyn lamination on inside surface and shall meet the requirements of ASTM B209 alloy 3003 H14. Cladding metal sheets (all types) shall have minimum thickness as below:

Item	Insulation O.D (mm)	Thickness (SWG)
Pipe	< 500	26
Pipe	> 500	24
Valves, flanges and foot traffic areas	-	22

3.5 Ancillary Materials

a. Securement Bands

For Insulation (Rock wool): Stainless steel type SS-304, 20 wide x 24SWG thick
For Cladding: Stainless steel of type SS-304, 12mm wide x 24 SWG thick.

b. Securement wire

For Insulation (PIR): Stainless steel type SS-304, min. 0.56mm diameter.

3.6 Joint sealant for joints of PIR insulation blocks

The joint sealant for joints between insulation blocks shall be compatible with the base insulation material and suitable for the temperature range to which it is exposed. Typical material and technical requirement for PUR/PIR insulation system is specified below.
Industry benchmark for joint sealant is Foster make 95-50. Proposed materials shall be technically equivalent and shall have proven reference for use in a temperature range and shall meet the minimum technical requirement given below:

General Characteristics	Combustibility/fire resistance	Water vapour permeance (max)
Average 82% volume solid as per ASTM D2369	Flame spread ASTM E-84 and fuel contribution negligible when used as 3.2 mm wide sealant between joints of incombustible insulation blocks	Negligible when measured across 3.2 mm wide sealant between joints of impermeable insulation blocks

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3.7 Joint sealant for joints of metal cladding

The technical requirement and typical material for joint sealant of metal cladding is specified below.

General Characteristics	Combustibility/ fire resistance	Water vapour permeance (max)
Average 52% volume solid as per ASTM C461	FSI (flame spread index) < 20 as per ASTM E-84, tested on a 6.3mm inorganic reinforced cement board with DFT ~2mm	0.0092 metric perms (as per ASTM F-1249 with DFT 2.8mm)

Industry benchmark for metal joint sealant is Foster make 95-44. Proposed materials shall be technically equivalent and shall have proven reference for use in a temperature range and shall meet the minimum technical requirement given above.

3.8 Vapour barrier multiplex foil of aluminium/ polyester:

The vapor barrier foil shall be applied over the PIR segments. It shall confirm to the following requirements:

Foil composition:	12 µm polyester film
	25 µm aluminum foil
	12 µm polyester film
Tensile strength Yield strength Tear resistance	100 MPa 70 N / cm 400 g / mm
Temperature range	+120°C to -60°C
Volumetric mass	1.93 kg / dm^3
Water vapour permeability in acc. with ASTM E 96, procedure E (37.8°C, 90% RH)	max. 10.10-6 g / (m^2.h.mmHg)

3.9 Vapour barrier multiplex tape of aluminium / polyester

The tape is used to seal the joints in the Vapour barrier multiplex foil of aluminium/ polyester. It shall meet the following requirements:

Foil composition	12 µm polyester film
	25 µm aluminium foil
	12 µm polyester film
Total thickness exclusive of adhesive layer	50 µm
Temperature range	+120°C to -45°C
Volumetric mass	1.93 kg / dm^3
Water vapour permeability in acc. with ASTM E 96, procedure E (37.8°C, 90% R.H.)	Max. 10.10-6 g / (m^2.h.mmHg)
Tensile strength	100 MPa
Yield strength	70 N / cm
Tear resistance	400 g / mm
Bonding strength in accordance with ASTM D 3330	19 N (tape width 25 mm)
Shearing, ASTM D 3654, procedure A	15 kPa
Tensile strength in accordance with ASTM D 3759	81 N (tape width 25 mm)

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4.0 APPLICATION

4.1 Surface of the piping shall be blast cleaned to a minimum SA 2.5 with required surface profile. It shall be the Contractor's responsibility to remove loosely adhering scale and dirt before applying paint and insulation.

4.2 After blast cleaned the piping shall be coated with the specified coating system. Quality of paint, application and thickness shall be as per respective painting specification applicable for the project.

4.3 The insulation shall be so designed, stored and applied such that ingress of water is prevented, leaked product must drain off and vapour should escape.

4.4 All hydrostatic tests must be done on the piping before insulating material is applied.

4.5 Any specific requirement specified by the manufacturer of the insulation for storage shall be complied by the contractor.

4.6 The requirement of heat container shall be verified from electrical heat tracing manufacturer. The heat container shall be prepared by applying Al-foil of thickness 0.1-0.15mm all the piping along with tracer prior to installation of Rockwool blankets.

4.7 The Rockwool blankets shall be applied with the joints tightly butted (10mm) with each other and secured with SS band at 200mm centres.

4.8 PIR shall be installed over the Rockwool blanket with joint sealant and finally shall be secured SS wire at 225 mm centres. The adjacent PIR segments shall be installed with their ends staggered with respect to each other by atleast one-half length of the block.

4.9 Multiplex vapour barrier shall be applied over the PIR Insulation for operating temperature up to 175°C.

4.10 The joints of the vapor barrier foil shall be overlapped by 50mm. The joints shall be sealed with a tape confirming to the specification as mentioned in clause no.3.9.

4.11 Vapour barrier shall be protected by cladding it with specified Aluminum cladding/ Stainless cladding (in case of fire safe insulation). All joints between adjacent aluminium sheets shall be staggered and grooved with a minimum overlap of 25mm, and suitably sealed with approved sealer. The longitudinal joints shall have single grooves while the circumferential joints shall have two grooves. SS bands/clips at an interval of 425mm shall be used to secure the cladding in position. Self-tapping screws shall not be used.

4.12 The cladding shall be installed such that moisture at the inside can be drained. At horizontal piping, in the middle between two supports, at the lowest point, drain holes shall be provided, min. 1 hole／6 m, dia. 10 mm and at the lowest point of vertical bends, connections etc.

4.13 Flanges, valves, shall have the same insulation thickness as the piping. The stuffing box shall be excluded from the insulation, except in the case of valves with extended spindle.

4.14 Pipe insulation systems shall start at a distance 'bolt length 30 mm.' from flanges to prevent damage to the insulation when opening that flange.

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4.15 All the flages, valves insulation shall be designed with removable type insulation system.

5.0 GAURANTEE & TEST CERTIFICATES

Insulation contractor shall guarantee all insulation works against the defects due to material and workmanship effecting performance for a period of eighteen months from the date of completion of total insulation works and shall repair /replace promptly, without cost, any part or parts of the material that fails within said period.

All the test certificates required as per this document shall also be furnished along with the supply of materials.

6.0 INFORMATION REQUIRED FROM CONTRACTOR

Following information shall be submitted by the contractor:

6.1 Manufacturer datasheet for Insulation and Ancillaries materials

6.2 Compliance datasheet for Insulation and Ancillaries materials

6.3 Detailed application procedure including surface preparation, painting, storage, application of Rockwool blankets, PIR and ancillaries items.

6.4 Quality assurance plan (QAP) and Inspection test Plan (ITP) of insulation materials and ancillary items from the manufacturers shall be submitted by contractor.

6.5 Quality assurance plan (QAP) and Inspection test Plan (ITP) of insulation application.

6.6 Credential of insulation applicator and CV of the insulation Inspector/supervisor.

6.7 Copies of all physical and chemical test certificates (duly endorsed by the inspection agency) for insulation and ancillaries materials.

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PIPING MATERIAL SPECIFICATION

(B957-6-44-0005)

Client : **BPCL**

Project : **MPMC & EPCM-1 FOR BPREP**

Location : **BINA, MADHYA PRADESH**

Job No. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
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Abbreviations:

PMS : Piping Material Specifications

M : Matching (Schedule/ Thickness)

IBR : Indian Boiler Regulations

NACE : National Association of Corrosion Engineers

HDPE : High Density Poly Ethylene

NDT : Non Destructive Testing

PE : Plain End

BE : Bevel End

PBE : Plain Both Ends

ASTM : American Society for Testing & Materials

API : American Petroleum Institute

ASME : American Society of Mechanical Engineers

SW : Socket Weld

BW : Butt Weld

BHN : Brinell Hardness Number

MP Test: Magnetic Particle Test

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2	Annexure-I, Job Piping Material Specification General Notes, (B957-6-44-0005-A1) REV.0	21
3	Annexure-II, Piping Material Specification Extracts, (B957-6-44-0005-A2) REV.0	38

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	

PIPING MATERIAL SPECIFICATION INDEX

Sl. No	Piping Class	Rating	C.A	Spl. Reqt.	Basic Material	Service	Remarks
1	A11A	150	3		CARBON STEEL	MILD SOUR FLARE (NON NACE) - REFER NOTE 34.	ECU (A1D)
2	A19A	150	3		CARBON STEEL	NONNACE MILD CORROSIVE SOUR & AMINE - STRESS RELIEVED; NON NACE SOUR FLARE. CAUSTIC (STRESS RELIEVED ZONE)	
3	A1A	150	1.5		CARBON STEEL	NON CORROSIVE/ FLAMMABLE / NON FLAMMABLE/ NON LETHAL -PROCESS & HYDROCARBONS; FUEL GAS,HYDROCARBON FLARE ; LUBE OIL BEFORE FILTER; AMMONIA, STEAM & CONDENSATE (NON IBR); UTILITIES- INST AIR(BEYOND A3A IN OFFSITES DISTRIBUTION), OWS (PRESSURIZED), PLANT AIR, NITROGEN, CARBONDIOXIDE, ; WATER - BEYOND A3A, DECOKING AIR, MINERAL OIL, PROCESS AIR, REGENERATION NITROGEN.	ECU (A1B & H1A), PPU (LGP04, LGP06, LGP07, LPU32 & LPU86) & UNIVATION SWING (1C2, 1C13 & 1C15)
4	A1D	150	1.5		1.25 Cr + 0.5Mo	NON CORROSIVE HYDROCARBON & PROCESS SERVICES. FLAMMABLE & NON-LETHAL	
5	A1K	150	0		SS 304	PURE NON CORROSIVE OR MILD CORROSIVE HYDROCARBONS FLAMMABLE/NON FLAMMABLE & NON LETHAL HYDROCARBONS, LUBE OIL (AFTER FILTERS), CHEMICALS ETC., NITROGEN, INSTRUMENT AIR(BEYOND CAT-'D' WITHIN UNITS & OFFSITE PACKAGES)	ECU (H3A), PPU (LES76) & UNIVATION SWING (6C1)
6	A1N	150	0		SS 316L	MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE/NON FLAMMABLE & NON LETHAL.	
7	A20K	150	0	CRYOGENIC SERVICE	SS 304/304L	T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP09)	PPU (LGP09)
8	A21A	150	1.5		CARBON STEEL	T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP01)	PPU (LGP01)
9	A21K	150	0		SS 304/304L	CHEMICALS; VENTS (BASED ON LICENSOR PMS CLASS - L7C8F)	PPU (L7C8F)
10	A21P	150	0		ALLOY 20	SULFURIC ACID	ECU WAO (NI1.1)

Package : IPMCS

Report No. : 50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	

PIPING MATERIAL SPECIFICATION INDEX

Sl. No	Piping Class	Rating	C.A	Spl. Reqt.	Basic Material	Service	Remarks
11	A21Y	150	0		MISCELLANEOUS	CATALYST CHEMICALS (REFER LICENSOR PMS CLASS - 72C1)	UNIVATION SWING (72C1)
12	A23K	150	0		SS 304/304L	RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - L7A1)	PPU / UNIVATION SWING (L7A1)
13	A24A	150	1.5		CARBON STEEL	HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP08)	PPU (LGP08)
14	A24K	150	0		SS 304/304L	CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE (BASED ON LICENSOR PMS CLASS - LGP41)	PPU (LGP41)
15	A27K	150	0		SS 304/304L	DENSE/DILUTE PHASE CONVEYING; ADDITIVE CONVEYING (BASED ON LICENSOR PMS CLASS - 7C50)	UNIVATION SWING (7C50)
16	A28K	150	0		SS 304/304L	RESIN CONVEYING / DILUTE PHASE / PELLETS (BASED ON LICENSOR PMS CLASS - LC52)	PPU (LC52)
17	A28M	150	0		SS 316/316L	RESIN CONVEYING GRAVITY FLOW (BASED ON LICENSOR PMS CLASS - LGP40)	PPU (LGP40)
18	A2A	150	1.5	IBR SERVICE	CARBON STEEL	STEAM (IBR), BOILER FEED WATER (IBR) & CONDENSATE (IBR)	ECU (A1A) & PPU (LPU02)
19	A32A	150	1.5		CARBON STEEL	NONIBR STEAM TRACING (BEYOND STEAM SUPPLY MANIFOLD ISOLATION VALVES),NONIBR TRACER CONDENSATE. IN CASE PRES-INSULATED TUBING IS TO BE USED, THIS SPEC SHALL BE USED ONLY FOR TRACING ALONG CS TRACED PIPING.	
20	A34M	150	0		SS 316	CHEMICALS (BASED ON LICENSOR PMS CLASS - 6G71)	UNIVATION SWING (6G71)
21	A35L	150	0		MISCELLANEOUS	AIR: BIN PURGE, CONVEYING AIR SUPPLY (BASED ON LICENSOR PMS CLASS - 4C3)	UNIVATION SWING (4C3)
22	A35M	150	0		SS 316	ADDITIVES (BASED ON LICENSOR PMS CLASS - 6G73)	UNIVATION SWING (6G73)

Package : **IPMCS**

Report No. : **50**

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	

PIPING MATERIAL SPECIFICATION INDEX

Sl. No	Piping Class	Rating	C.A	Spl. Reqt.	Basic Material	Service	Remarks
23	A36L	150	0		MISCELLANEOUS	RESIN CONVEYING (BASED ON LICENSOR PMS CLASS - 4C4)	UNIVATION SWING (4C4)
24	A37K	150	0		SS 304	ALL PURPOSE (BASED ON LICENSOR PMS CLASS - 6G69)	UNIVATION SWING (6G69)
25	A37L	150	0		MISCELLANEOUS	RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - 4C8)	UNIVATION SWING (4C8)
26	A3A	150	1.5		CARBON STEEL	NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DIOXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR), CRWS/ SS/ VENT (A/G). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE.	ECU (H1A), PPU (LPU32 & LPU86) & UNIVATION SWING (1C13)
27	A3K	150	0		SS 304	DEMINERALISED WATER (OUTSIDE DM PLANT BATTERY LIMITS), POLISHED WATER, POLISHED CONDENSATE, DM WATER BEYOND CATEGORY - 'D', NITROGEN, INSTRUMENT AIR(WITHIN UNITS & OFFSITE PACKAGES) - CATEGORY 'D'	ECU (H3A) & PPU (LES76)
28	A40A	150	3	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETC., DRY FLARE, LIQUID DRAIN, PROPYLENE REFRIGERANT, ETHYLENE REFRIGERANT	ECU (A2A)
29	A41A	150	1.5		CARBON STEEL	CLEAN HYDROCARBONS VAPOR/LIQUID, OFF GAS, N-HEXANE/C6, BUTENE VAPOR, NITROGEN, LIQUID BUTENE	AXENS BUTENE (A1A)
30	A41K	150	0	CRYOGENIC SERVICE	SS 304	MILD TO MODERATE CORROSIVE PROCESS & HYDROCARBON SERVICES BELOW MINUS 45 DEG C - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL- LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.	ECU (A21L & A21K)
31	A42A	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	CLEAN HYDROCARBONS (MIXTURE ETHYLENE / BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) - 45°C MINIMUM , LIQUID BUTENE	AXENS BUTENE (A1K)

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32	A42K	150	0	CRYOGENIC SERVICE	SS 304/304L	HYDROCARBONS - FLARE (BASED ON LICENSOR PMS CLASS - LC62)	PPU (LC62)
33	A43A	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM , LIQUID BUTENE	AXENS BUTENE (A2K)
34	A44A	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)	AXENS BUTENE (A2A)
35	A44K	150	0.75		SS 304	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)	AXENS BUTENE (A2S)
36	A45A	150	1.5		CARBON STEEL	SPENT CATALYST, HC SLURRY	AXENS BUTENE (A3A)
37	A45K	150	0.75		SS 304	SPENT CATALYST, HC SLURRY	AXENS BUTENE (A3S)
38	A46A	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM, PUMPAROUND, EFFLUENT, EVAPORATION LINES	AXENS BUTENE (A3K)
39	A4A	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, VENTS(HIGH TEMPERATURE) ETC.	PPU (L2C61)
40	A60K	150	0	NACE SERVICE	SS 304L	RICH AMINE, RICH AMINE WITH FLASHING H2S	ECU (A22A)
41	A61A	150	3	NACE SERVICE	CARBON STEEL	AMINE, SOUR HYDROCARBONS (H2S), SOUR WATER, STABILIZER COLUMN OVERHEAD (H2S ENVIRONMENT), ACID FLARE, METHANOL, AMINE CLOSED BLOWDOWN(MED).	ECU (A1WR)
42	A62A	150	6	NACE SERVICE	CARBON STEEL	AMINE, RICH AMINE WITH FLASHING H2S	ECU (A1WS)

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43	A69M	150	0		SS 316/316L	SPENT CAUSTIC	ECU WAO (SS4.1L)
44	A6K	150	1.5		SS 304L	CORROSIVE PROCESS SERVICE - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL - FLARE GAS, ACID GAS WITH CONDENSATE, REFLUX, CORROSIVE WATER, RICH AMINE, ETC.	
45	A71A	150	3		CARBON STEEL	BT EXTRACTION W/FV	ECU (A1DV)
46	A81A	150	0.75		CARBON STEEL	ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1C17)	UNIVATION SWING (1C17)
47	A81K	150	0	LOW TEMPERATURE SERVICE	SS 304/304L	ALKYL (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 3/4 INCH SIZES MAXIMUM.) (BASED ON LICENSOR PMS CLASS - 7C28)	UNIVATION SWING (7C28)
48	A82A	150	0.75		CARBON STEEL	SOLIDS CONVEYING (BASED ON LICENSOR PMS CLASS - 1C14)	UNIVATION SWING (1C14)
49	A83A	150	3		CARBON STEEL	SULFURIC ACID (93 ~ 98% CONCENTRATION, MAX. VELOCITY 0.9 M/S)	ECU (A1F)
50	A88A	150	0.75		CARBON STEEL	CYCLIC PRESSURE;HYDROCARBONS (BASED ON LICENSOR PMS CLASS - 1C11)	UNIVATION SWING (1C11)
51	A8A	150	3		CARBON STEEL	SULPHURIC ACID (80-98% CONC.) - TOXIC BUT NON LETHAL.	
52	A91A	150	1.5		CARBON STEEL	COOLING WATER, RAW WATER, SERVICE WATER (UNDER GROUND) CATEGORY "D"	
53	A92K	150	0		SS 304	LUBE OIL, SEAL OIL, TRUE INHIBITOR DNBP, TBC, AKOH SOLUTION, PHOSPHATE, DMDS INJECTION, DEMINERALIZED WATER(BEYOND CATEGORY 'D').	ECU (A21A)

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54	A94A	150	1.5		CARBON STEEL	FIRE WATER-FRESH WATER (ABOVE GROUND)	
55	A94M	150	0		SS 316	CONCENTRATE FOAM	ECU
56	A95A	150	1.5		CARBON STEEL	CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING	
57	A96A	150	1.5		CARBON STEEL	CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING	
58	A97A	150	1.5		CARBON STEEL	FIRE WATER- FRESH WATER (UNDER GROUND)	
59	A99A	150	3		CARBON STEEL	CAUSTIC SERVICE, SODIUM HYDROXIDE, HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 30 WT% AT MAX. TEMPERATURE 60 DEG. C, 40 WT% AT MAX. TEMPERATURE 50 DEG.C, AND 50 WT% AT MAX. TEMPERATURE 45 DEG.C), CAUSTIC BLOWDOWN.	ECU (A1NR)
60	A9A	150	3		CARBON STEEL	MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE / NON FLAMMABLE & NON LETHAL - HVGO,VGO,RCO,SLOP,VR,VGO,CAUSTIC (NO STRESS RELIEF ZONE), BENZENE, CGC AREA CBD, DEBUTANIZER AREA CBD, PGH AREA CBD, QUENCH WATER DRAIN, QUENCH OIL BLOW DOWN, AROMATIC CLOSED DRAIN, CLOSED SOLVENT DRAIN.	ECU (A1d)
61	B1A	300	1.5		CARBON STEEL	NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - HYDROCARBONS, AROMATICS, AMMONIA, SWEET GAS, FLUSHING OIL AND OTHER UTILITIES -MP CONDENSATE, INSTRUMENT AIR(OFFSITES), PLANT AIR, NITROGEN, AMMONIA GAS, NITROGEN-HIGH TEMPERATURE ETC. ABOVE CLASS 'A1A'.	ECU (B1B), PPU (LGP18 & LGP26) & UNIVATION SWING (1C2, 1E3 & 1E21)
62	B1K	300	0		SS 304	PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/ NON FLAMMABLE & NON LETHAL HYDROCARBONS, CHEMICAL, LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION ETC.	

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63	B20D	300	3	IBR SERVICE	1.25 Cr + 0.5Mo	HP STEAM	ECU (B54A)
64	B20K	300	0		SS 304/304L	T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP27)	PPU (LGP27)
65	B20Y	300	0		TEFLON LINED CS	SPENT CAUSTIC, SULFURIC ACID	ECU WAO (CSL1.2)
66	B21A	300	1.5		CARBON STEEL	T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP16)	PPU (LGP16)
67	B21P	300	0		ALLOY 20	SULFURIC ACID	ECU WAO (NI1.2)
68	B21Q	300	0		INCONEL 600	SPENT CAUSTIC	ECU WAO (NI2.2)
69	B24A	300	1.5		CARBON STEEL	HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP21)	PPU (LGP21)
70	B27A	300	1.5		CARBON STEEL	PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) (BASED ON LICENSOR PMS CLASS - LPZ18)	ppu (LPZ18)
71	B28A	300	1.5		CARBON STEEL	CYCLE GAS (BASED ON LICENSOR PMS CLASS - LGP24)	PPU (LGP24)
72	B2A	300	1.5	IBR SERVICE	CARBON STEEL	SBOILER BLOWDOWN, LP BOILER FEED WATER, MP STEAM, MP CONDENSATE-ALL IBR	ECU (B1A) & PPU (LPU04)
73	B40A	300	3	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -47 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETHYLENE ETC.	ECU (B2A)
74	B41A	300	1.5		CARBON STEEL	CLEAN HYDROCARBONS VAPOR/LIQUID OFF GAS N-HEXANE/C6, BUTENE VAPOR, NITROGEN , LIQUID BUTENE	AXENS BUTENE (B1A)

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75	B41K	300	0	CRYOGENIC SERVICE	SS 304	MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL-LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.	ECU (B21L & B21K)
76	B42A	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	CLEAN HYDROCARBONS (MIXTURE EHYLENE/BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM , LIQUID BUTENE	AXENS BUTENE (B1K)
77	B42K	300	0	CRYOGENIC SERVICE	SS 304/304L	HYDROCARBONS-LIQUID / VAPOR; LOW TEMPERATURE AND HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASSES - LGP45 & L6E57)	PPU (L6E57 & LGP45)
78	B43A	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM	AXENS BUTENE (B2K)
79	B43K	300	0	CRYOGENIC SERVICE	SS 304	HYDROCARBONS:LOW TEMPERATURE & HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASS - 6E57)	UNIVATION SWING (6E57)
80	B44A	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)	AXENS BUTENE (B2A)
81	B44K	300	0.75		SS 304	DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)	AXENS BUTENE (B2S)
82	B45A	300	1.5		CARBON STEEL	HC SLURRY (POLYMER + CATALYST):- PUMPAROUND, EFFLUENT, EVAPORATION LINES	AXENS BUTENE (B3A)
83	B45K	300	0.75		SS 304	SPENT CATALYST, HC SLURRY	AXENS BUTENE (B3S)
84	B46A	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) -45°C MINIMUM PUMPAROUND, EFFLUENT, EVAPORATION LINES	AXENS BUTENE (B3K)
85	B46K	300	0	CRYOGENIC SERVICE	SS 304/304L	PRODUCT DISCHARGE (BASED ON LICENSOR PMS CLASS - LGP44)	PPU (LGP44)

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86	B47A	300	0.75	LOW TEMPERATURE SERVICE	CARBON STEEL	HYDROCARBONS, HP NITROGEN, RECOVERED GAS (BASED ON LICENSOR PMS CLASS - 2E63 & 2E18).	UNIVATION SWING (2E18 & 2E63)
87	B48A	300	0.75	LOW TEMPERATURE SERVICE	CARBON STEEL	CONVEYING SOLIDS (BASED ON LICENSOR PMS CLASS - 2E65)	UNIVATION SWING (2E65)
88	B4A	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETC.	PPU (LGP58)
89	B4D	300	3		1.25 Cr + 0.5Mo	NON CORROSIVE HYDROCARBONS ABOVE 454 DEG C - FLAMMABLE & NON LETHAL- HIGH TEMPERATURE TRANSFER LINES.	ECU (A54A & B54A)
90	B52A	300	3	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN (FEED & PRODUCT)	ECU (A1E & B1E)
91	B55A	300	1.5	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP57)	PPU (LGP57)
92	B5A	300	1.5	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN AND HYDROGEN BEARING HYDROCARBONS - FLAMMABLE, TOXIC/NON-TOXIC BUT NON-LETHAL.	
93	B60K	300	0		SS 304L	RICH AMINE, RICH AMINE WITH FLASHING H2S.	ECU (B22A)
94	B61A	300	3	NACE SERVICE	CARBON STEEL	NACE CORROSIVE, FLAMMABLE AND NONLETHAL SOUR SERVICES (STRESS RELIEVED) - SOUR WATER, AMINE, SOUR HYDRO CARBONS(H2S), METHANOL	ECU (B1WR)
95	B62A	300	6	NACE SERVICE	CARBON STEEL	AMINE, RICH AMINE WITH FLASHING H2S	ECU (B1WS)
96	B69M	300	0		SS 316/316L	SPENT CAUSTIC	ECU WAO (SS4.2L)

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97	B81A	300	0.75		CARBON STEEL	ALKYLS,ADDITIVES & CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1E20)	UNIVATION SWING (1E20)
98	B82A	300	0.75		CARBON STEEL	COVEYING SOILDS (BASED ON LICENSOR PMS CLASS - 1E23)	UNIVATION SWING (1E23)
99	B84A	300	0.75		CARBON STEEL	CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E22)	UNIVATION SWING (1E22)
100	B86A	300	0.75		CARBON STEEL	REACTOR PRODUCT DISCHARGE-PRODUCT CONVEYING (BASED ON LICENSOR PMS CLASS - 1E64)	UNIVATION SWING (1E64)
101	B88A	300	0.75		CARBON STEEL	CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - 1E18)	UNIVATION SWING (1E18)
102	B89A	300	0.75		CARBON STEEL	CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E87)	UNIVATION SWING (1E87)
103	B92K	300	0		SS 304	LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION.	ECU (B21A)
104	B99A	300	3		CARBON STEEL	CAUSTIC (STRESS RELIEVED ZONE), SODIUM HYDROXIDE HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 20%~50% AT TEMP. 93 DEG.C ~ 45 DEG.C)	ECU (B1NR)
105	B9A	300	3		CARBON STEEL	MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, ETC. HYDROCARBON,QUENCH OIL, PROCESS WATER, FUEL OIL	ECU (b1d)
106	D1A	600	1.5		CARBON STEEL	NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABL AND NON LETHAL - PETROLEUM PRODUCTS: FO. FG, SWEET GAS, INHIBITOR SOLUTION, NH3, BRINE (MINUS 10 DEG C), CO2, CAUSTIC SODA (20 BE MAX & TEMP 70 DEG C MAX), PARAXYLENE, BITUMEN, ETHYLENE, DONOR, VAPORIZED PROPYLENE, HIGH PRESSURE PURIFIED NITROGEN.	PPU (LGP56) & UNIVATION SWING (1G21)

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107	D1K	600	0		SS 304	PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/NON-FLAMMABLE & NON-LETHAL HYDROCARBONS, CHEMICALS ETC.	UNIVATION SWING (6G4)
108	D20K	600	0		SS 304/304L	T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - L7E28)	PPU (L7E28)
109	D20Q	600	0	IBR SERVICE	INCONEL 600	HIGH PRESSURE STEAM	ECU WAO (NI2.3)
110	D21K	600	0		SS 304/304L	HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - L7G7)	PPU (L7G7)
111	D23F	600	4.5		5 Cr + 0.5 Mo	MILD TO MODERATE CORROSIVE PROCESSES - FLAMMABLE & NON-LETHAL- CRUDE OIL, RCO, LVGO, HVGO, VB, TAR, VACUUM RESIDUE, TRANSFER LINES, FUEL OIL, DIESEL, HYDROCARBONS, HIGH TEMPERATURE TRANSFER LINES	ECU (D56F)
112	D23M	600	0		SS321	CORROSIVE LIQUID, VAPOUR AND GAS - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL, HYDROGENATION, PYROLYSIS GAS, SECOND STAGE REACTOR	ECU (D26A)
113	D28A	600	1.5		CARBON STEEL	CYCLE GAS; CYCLIC SERVICE; NITROGEN; (BASED ON LICENSOR PMS CLASS - LPZ04)	PPU (LPZ04)
114	D2A	600	1.5	IBR SERVICE	CARBON STEEL	STEAM (IBR), STEAM CONDENSATE(IBR), BOILER FEED WATER (IBR), HP STEAM(IBR), HP CONDENSATE (IBR).	ECU (D1A) & PPU (L1G8)
115	D2D	600	1.5	IBR SERVICE	1.25 Cr + 0.5Mo	STEAM (IBR) ABOVE 454 DEG C	ECU (D54A)
116	D34K	600	0		SS 304/304L	PROCESS TUBING - RO, CATALYST BLOW BACK (BASED ON LICENSOR PMS CLASS - LGP55)	PPU (LGP55)
117	D36A	600	0.75	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN AND HYDROGEN BEARING HYDROCARBONS - FLAMMABLE & NON-LETHAL, KILL GAS (BASED ON LICENSOR PMS CLASS - 1G4/1G4A)	UNIVATION SWING (1G4/1G4A)

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118	D36K	600	0	HYDROGEN SERVICE	SS 304/304L	HYDROGEN (BASED ON LICENSOR PMS CLASS - 6G57)	UNIVATION SWING (6G57)
119	D40A	600	3	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE REFRIGERANT, XYLENE, METHANOL, ETHYLENE REFRIGERANT, NH3, GAS FLARE, ETC.	ECU (D2A)
120	D41K	600	0	CRYOGENIC SERVICE	SS 304	MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C - FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL	ECU (D21L & D21K)
121	D42A	600	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	CLEAN HYDROCARBONS(MIXTURE ETHYLENE/BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) -45 DEG C MINIMUM LIQUID BUTENE	AXENS BUTENE (C1K)
122	D42K	600	0		SS 304/304L	HYDROCARBONS, HP NITROGEN, CYCLIC PRESSURE (BASED ON LICENSOR PMS CLASS L6G5)	PPU (L6G5)
123	D4A	600	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETHYLENE, COMONOMER (1-BUTENE / 1-HEXENE), VENT TO FLARE, RECOVERED GAS, RECOVERED LIQUID ETC.	PPU (LGP30) & UNIVATION SWING (2E21)
124	D54K	600	0	CRYOGENIC SERVICE	SS 304/304L	HYDROGEN (BASED ON LICENSOR PMS CLASS - LPZ17)	PPU (LPZ17)
125	D55A	600	1.5	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP31)	PPU (LGP31)
126	D5A	600	1.5	HYDROGEN SERVICE	CARBON STEEL	HYDROGEN AND HYDROGEN BEARING HYDROCARBONS - FLAMMABLE & NON-LETHAL.	
127	D69M	600	0		SS 316/316L	SPENT CAUSTIC	ECU WAO (SS4.3L)

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	

PIPING MATERIAL SPECIFICATION INDEX

Sl. No	Piping Class	Rating	C.A	Spl. Reqt.	Basic Material	Service	Remarks
128	D81K	600	0	LOW TEMPERATURE SERVICE	SS 304/304L	ALKYL, PRODIGYTM BMC CATALYST, MODIFIER D (BASED ON LICENSOR PMS CLASSES - 7E28 & 7G28).	UNIVATION SWING (7E28 & 7G28)
129	D9A	600	3		CARBON STEEL	MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, PROCESS WET LIQUID DRAIN,.ETC.	ECU (d1d)
130	F22A	1500	1.5	IBR SERVICE	CARBON STEEL	STEAM, CONDENSATE, BOILER BLOWDOWN, FEEDWATER DISCHARGE AND CHEMICAL FEED TO BOILER ((AS PER ASME SEC-I)	ECU (F1AS); ASME SEC-I
131	F25A	1500	1.5		CARBON STEEL	CARBON MONOXIDE, REACTION KILL (BASED ON LICENSOR PMS CLASS - LGP36)	PPU (LGP36)
132	F29K	600	0		SS 304/304L	CHEMICALS (BASED ON LICENSOR PMS CLASS - LC51)	PPU (LC51)
133	F2A	1500	1.5	IBR SERVICE	CARBON STEEL	STEAM AND BOILER FEED WATER (IBR), CONDENSATE (IBR)	ECU (F1A)
134	F2G	1500	1.5	IBR SERVICE	9CR-1MO-V	VERY HIGH PRESSURE STEAM (IBR)	
135	F36A	1500	0.75		CARBON STEEL	KILL GAS (BASED ON LICENSOR PMS CLASS - 1K6)	UNIVATION SWING (1K6)
136	F36K	1500	0		SS 304/304L	MODIFIER C (BASED ON LICENSOR PMS CLASS - 7K6)	UNIVATION SWING (7K6)
137	F55K	1500	0	LOW TEMPERATURE SERVICE	SS 304/304L	HYDROGEN; KILL GAS (BASED ON LICENSOR PMS CLASS - L7K6D)	PPU (L7K6D)
138	F81A	1500	0.75		CARBON STEEL	ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1K8)	UNIVATION SWING (1K8)

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PIPING MATERIAL SPECIFICATION INDEX

Sl. No	Piping Class	Rating	C.A	Spl. Reqt.	Basic Material	Service	Remarks
139	F92K	1500	0		SS 304	CORROSIVE SERVICE, PHOSPHATE SERVICE	ECU (F21B)
140	F9A	1500	3		CARBON STEEL	MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, HYDROCARBON, ETC.	ECU (F1D)
141	G22G	2500	1.5	IBR SERVICE	9CR-1MO-V	SUPER HIGH PRESSURE STEAM (IBR) & ASME SEC-I	ECU (G58AS); ASME SEC-I
142	G2G	2500	1.5	IBR SERVICE	9CR-1MO-V	SUPER HIGH PRESSURE STEAM (IBR)	ECU (G58A)
143	J2A	150	0		CS (Galv.)	DRINKING WATER (ABOVE GROUND / UNDER GROUND), FIRE WATER-SPRINKLER SYSTEM U/G ,A/G AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM.	ECU (H3A) & PPU (LPU47)
144	J95A	150	0		CS (Galv.)	FIRE WATER-SPRINKLER SYSTEM, WATER & FOAM SOLUTION (U/G& A/G) AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM	

Notes : 1. For PMS General notes refer Annexure-I of this document

2. For PMS Extracts refer Annexure-II of this document

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A11A** Sheet 1 of 7

PIPE CLASS : **A11A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

MILD SOUR FLARE (NON NACE) - REFER NOTE 34.

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.

92 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH B-16.34 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.

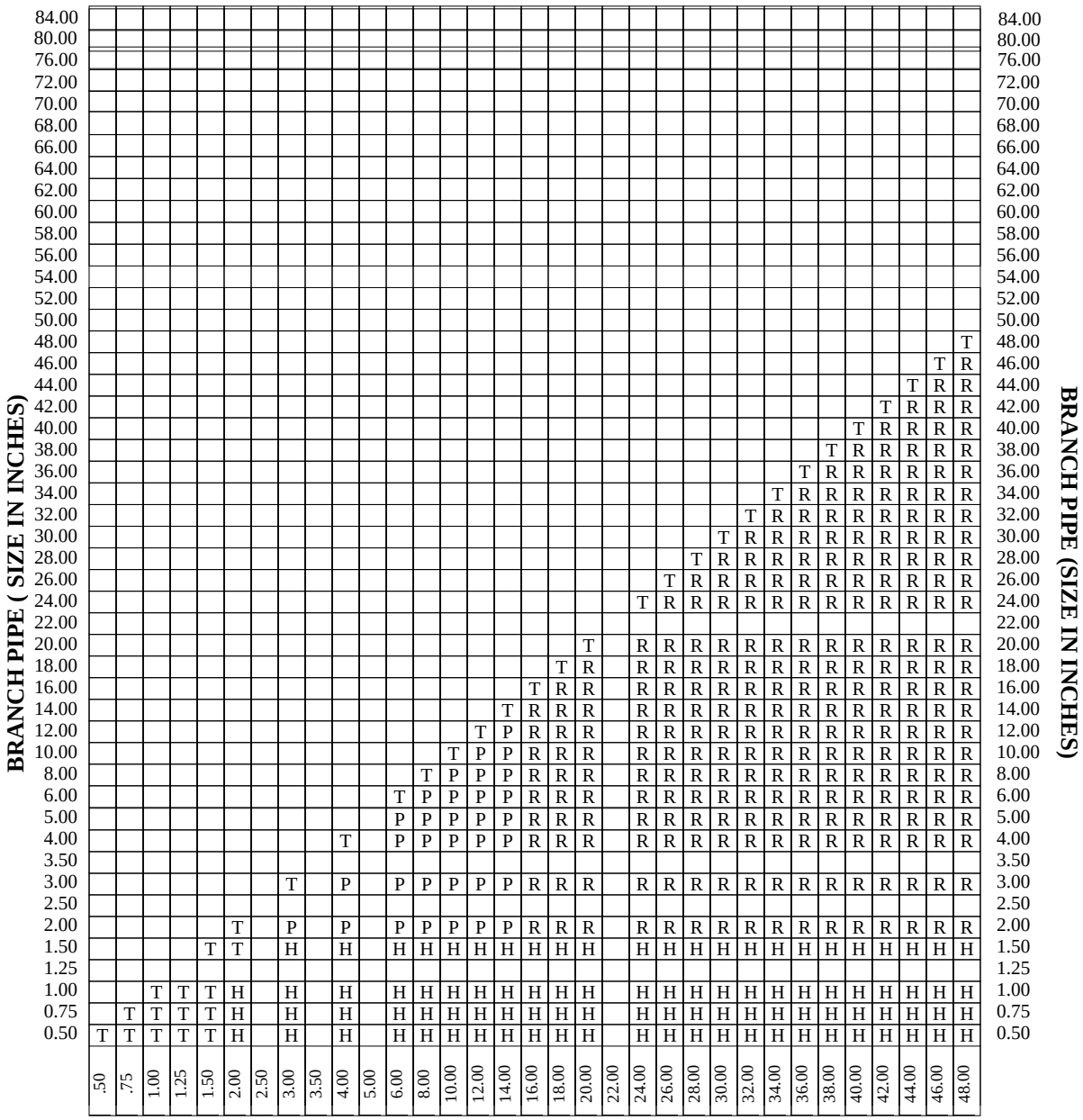
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A11A** Sheet 3 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	28	STD	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	
PIP	PIPE	30	30	STD	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	32
PIP	PIPE	32	44	XS	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	
PIP	PIPE	46	46	XS	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	32
PIP	PIPE	48	48	14.0	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	
PIP	PIPE	50	118	CALC	B-36.10	A672GR.B60 CL.12 (200 BHN MAX)	BE, E.FS.W	PI2H613Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG	FLNG.WN	26	60	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG	FLNG.WN	62	118	M	JOB'STD	ASTM A 105	150, RF/125AARH	FWF0127Z0	
FLG/300	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	60		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FLB	FLNG.BLIND	62	118		JOB'STD	ASTM A 105	150, RF/125AARH	FBF0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Flange Group									
FEF	SPCR&BLND	26	60		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	
FEF	SPCR&BLND	62	118		JOB'STD	ASTM A 516 GR.70	150, FF/125AARH	FCF6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	50	118	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WAM754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	50	118	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WBM754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TEQ	T.EQUAL	50	118	M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WEM754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
TRED	T.RED	50	118	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WRM754ZZ0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A11A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	50	118	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WUM754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	50	118	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WVM754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	50	108	CALC	ASME-VIII	ASTM A 516 GR.70	BW	WF3BY4ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	42		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	51301ZZZ0	92
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A11A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13%CR STEEL			
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301	52301ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	53301ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301	54301ZZZ0	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55301	55301ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	118		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	26	60		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS	GASKET	62	118		JOB'STD	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GKF6272Z0	
GAS/300	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A11A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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PIPE CLASS : **A19A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

NONNACE MILD CORROSIVE SOUR & AMINE - STRESS RELIEVED; NON NACE SOUR FLARE.

CAUSTIC (STRESS RELIEVED ZONE)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

42 ALL WELDS SHALL BE STRESS RELIEVED.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

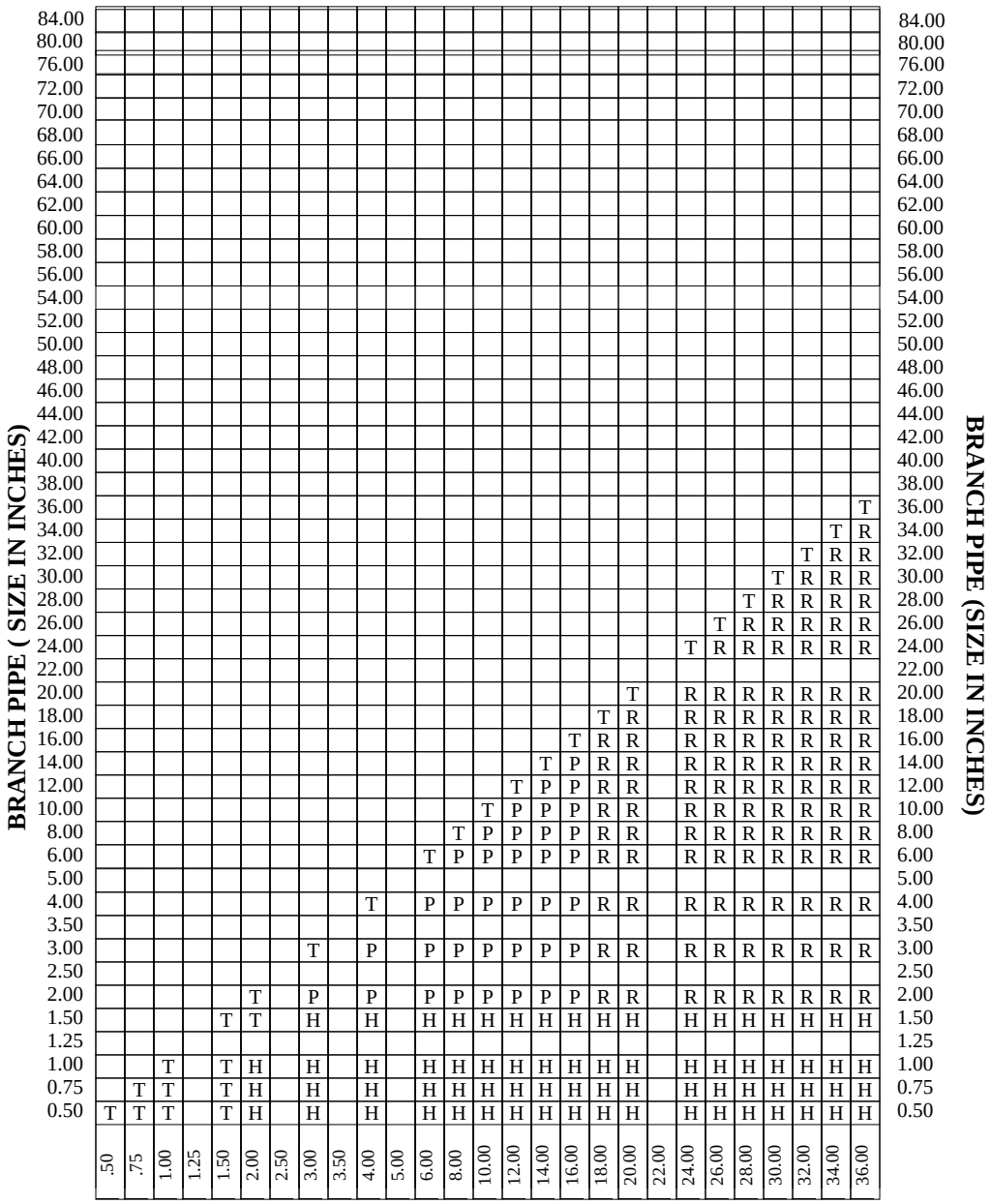
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A19A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A19A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A19A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	26	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
PIP	PIPE	30	30	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
PIP	PIPE	32	36	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG	FLNG.WN	26	36	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	36		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	36		ASME B16.47B/EIL' STD	ASTM A 516 GR.70(NORMALISED)	150, FF/125AARH	FCU8921Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	

Package : IPMCS
Report No. : 50

A19A

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Location BINA, MADHYA PRADESH	**Pipe Class :A19A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	36	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A19A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51013	51013ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51313	51313ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52013	52013ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52313	52313ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53013	53013ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53313	53313ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54313	54313ZZZ0	75
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105/ASTM A 216 GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55313	55313ZZZ0	
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-SS 304	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56313	56313ZZZ0	
BFV	VLV.BTRFLY	26	36		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-SS 304	FLGD, 150, B-16.47 B, RF/125AARH, SHT NO.- 56314	56314ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	36		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A19A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	26	36		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 150,FF/125AARH	ST17531Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 1 of 7

PIPE CLASS : **A1A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

NON CORROSIVE/ FLAMMABLE / NON FLAMMABLE/ NON LETHAL -PROCESS & HYDROCARBONS; FUEL GAS,HYDROCARBON FLARE ; LUBE OIL BEFORE FILTER; AMMONIA, STEAM & CONDENSATE (NON IBR); UTILITIES-INST AIR(BEYOND A3A IN OFFSITES DISTRIBUTION), OWS (PRESSURIZED), PLANT AIR, NITROGEN, CARBONDIOXIDE, ; WATER - BEYOND A3A, DECOKING AIR, MINERAL OIL, PROCESS AIR, REGENERATION NITROGEN.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

36 THIS IS A PRESSURE BALANCED PLUG VALVES WHICH SHALL BE USED ONLY IF SPECIFIED IN P&ID.

92 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH B-16.34 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

954 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE ONLY, IF MENTIONED IN PROCESS DESIGN PACKAGE OR P&ID.

961 FOR LICENSOR SPECIFICATION LGP04 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-361 & FOR 2" TO 8"-STR-351 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

962 FOR LICENSOR SPECIFICATIONS LGP06 & LGP07 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-366 & FOR 2" TO 12"-STR-351 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

967 FOR PPU UNIT-THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS. BUT VALVES ARE NOT VACUUM PREPARED OR SUITABLE BY DESIGN FOR CRITICAL VACUUM AND MAY ALLOW LEAKAGE INTO THE SYSTEM.

968 FOR PPU UNIT, LINE CONDITIONS SHALL BE CHECKED FOR VACUUM. IF VACUUM CONDITIONS ARE APPLICABLE, STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1.

969 FOR PPU UNIT, LINE CONDITIONS SHALL BE CHECKED FOR VACUUM. IF VACUUM CONDITIONS ARE APPLICABLE, VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

992 FOR LICENSOR SPECIFICATIONS 1C2 IN UNIVATION, FOR SIZE RANGE 0.5" TO 0.75": STR-361, FOR 1" TO 1.5"-STR-366 & FOR 2" TO 12" : STR-351 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

993 FOR LICENSOR SPECIFICATIONS 1C13 IN UNIVATION, FOR SIZE RANGE 0.5" TO 0.75": STR-361, FOR 1" TO 1.5"-STR-366 & FOR 2" TO 12" : STR-351 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

994 FOR LICENSOR SPECIFICATIONS 1C15 IN UNIVATION, FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2" TO 10" : STR-354 (20 MESH) IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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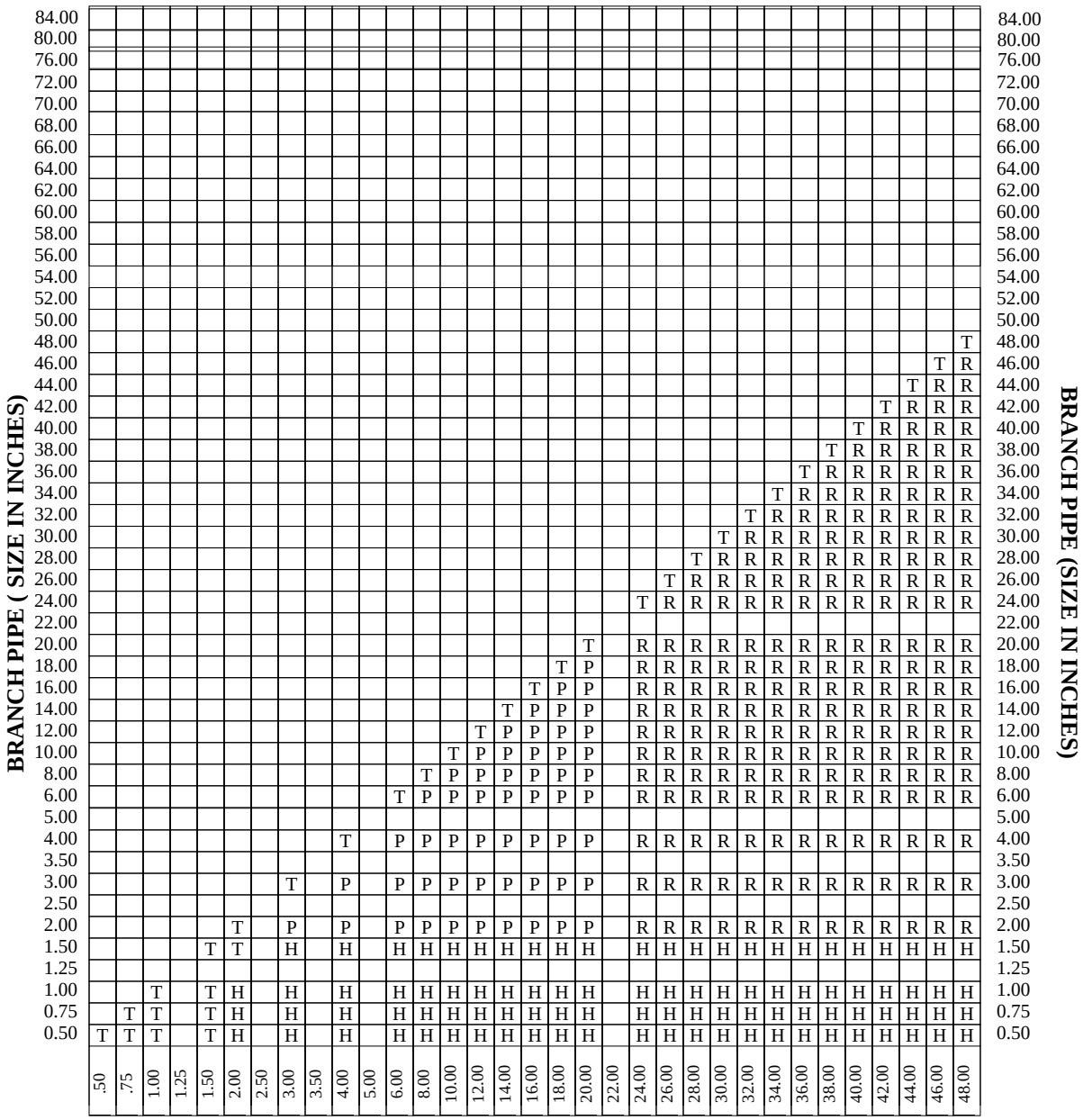
Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A1A

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Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	36	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	40	48	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG/300	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	42		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	51301ZZZ0	92
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301	52301ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	53301ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301	54301ZZZ0	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55301	55301ZZZ0	
PLV/1	VLV.PLUG	.5	36		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55315	55315ZZZ0	36
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56301	56301ZZZ0	
BFV	VLV.BTRFLY	26	48		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-	FLGD, 150, B-16.47 B, RF/125AARH, SHT	56315ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13% CR.STEEL	NO.- 56315		
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS/300	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH, FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1D** Sheet 1 of 5

PIPE CLASS : **A1D**
RATING : 150
BASE MATERIAL : 1.25 Cr + 0.5Mo
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.38	20.38	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

NON CORROSIVE HYDROCARBON & PROCESS SERVICES. FLAMMABLE & NON-LETHAL

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

13 USE NORMALIZED AND TEMPERED MATERIAL ONLY.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

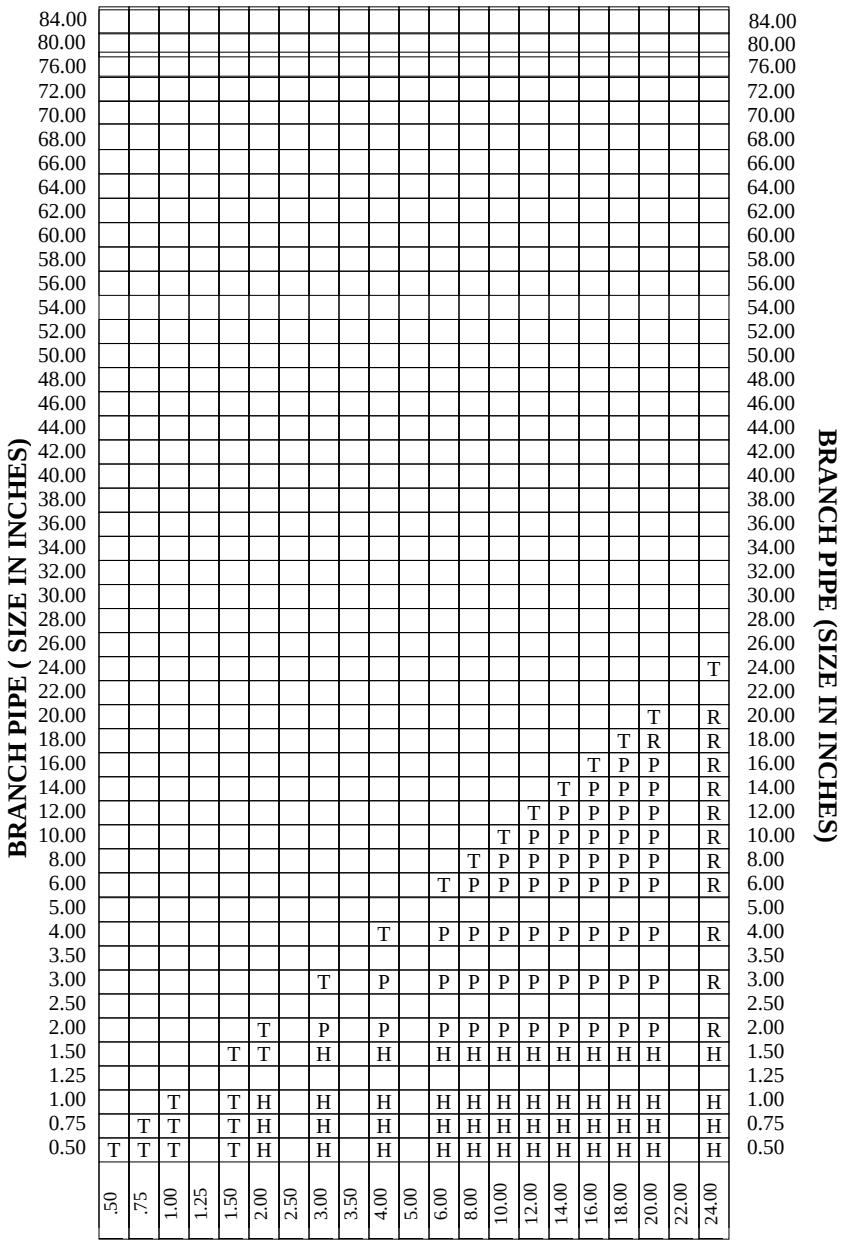
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1D** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A1D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1D** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z0	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F11 CL.2	150, RF/125AARH	FWC3727Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F11 CL.2	150, RF/125AARH	FBC3727Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F11 CL.2	150, FF/125AARH	FGK3721Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F11 CL.2	150, FF/125AARH	FCK3721Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WA638D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WA638D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WAG564Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WAG584Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WB638D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WB638D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WBG564Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WBG584Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WE638D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WE638D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WEG564ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1D** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WEG584ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WR638D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WR638D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WRG564ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WRG584ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WUG564ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WUG584ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WVG564ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WVG584ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WNH386ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WPH386ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WFG564ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WJ638D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WJ638D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WK638D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WK638D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WL638D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WL638D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WM638D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WM638D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51030	51030ZZZ0	

Package : IPMCS
Report No. : 50

A1D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1D** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51330	51330ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52030	52030ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52330	52330ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53030	53030ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53330	53330ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A387GR.11CL.1;INT:SS304	CONETYPE, 150,FF/125AARH	ST17431Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F11CL.2; INT:SS304	SW, Y-TYPE, 800	SP310D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WP11 CL.1; INT:SS304	BW, T-TYPE	SP17244Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WP11W CL.1;INT:SS304	BW, T-TYPE	SP17344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1K** Sheet 1 of 5

PIPE CLASS : **A1K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE

PURE NON CORROSIVE OR MILD CORROSIVE HYDROCARBONS
FLAMMABLE/NON FLAMMABLE & NON LETHAL HYDROCARBONS, LUBE OIL (AFTER FILTERS), CHEMICALS ETC., NITROGEN, INSTRUMENT AIR(BEYOND CAT-'D' WITHIN UNITS & OFFSITE PACKAGES)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

996 FOR LICENSOR SPECIFICATIONS 6C1 IN UNIVATION, FOR SIZE RANGE 0.5" TO 0.75": STR-415 & FOR 1" TO 10": STR-406 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

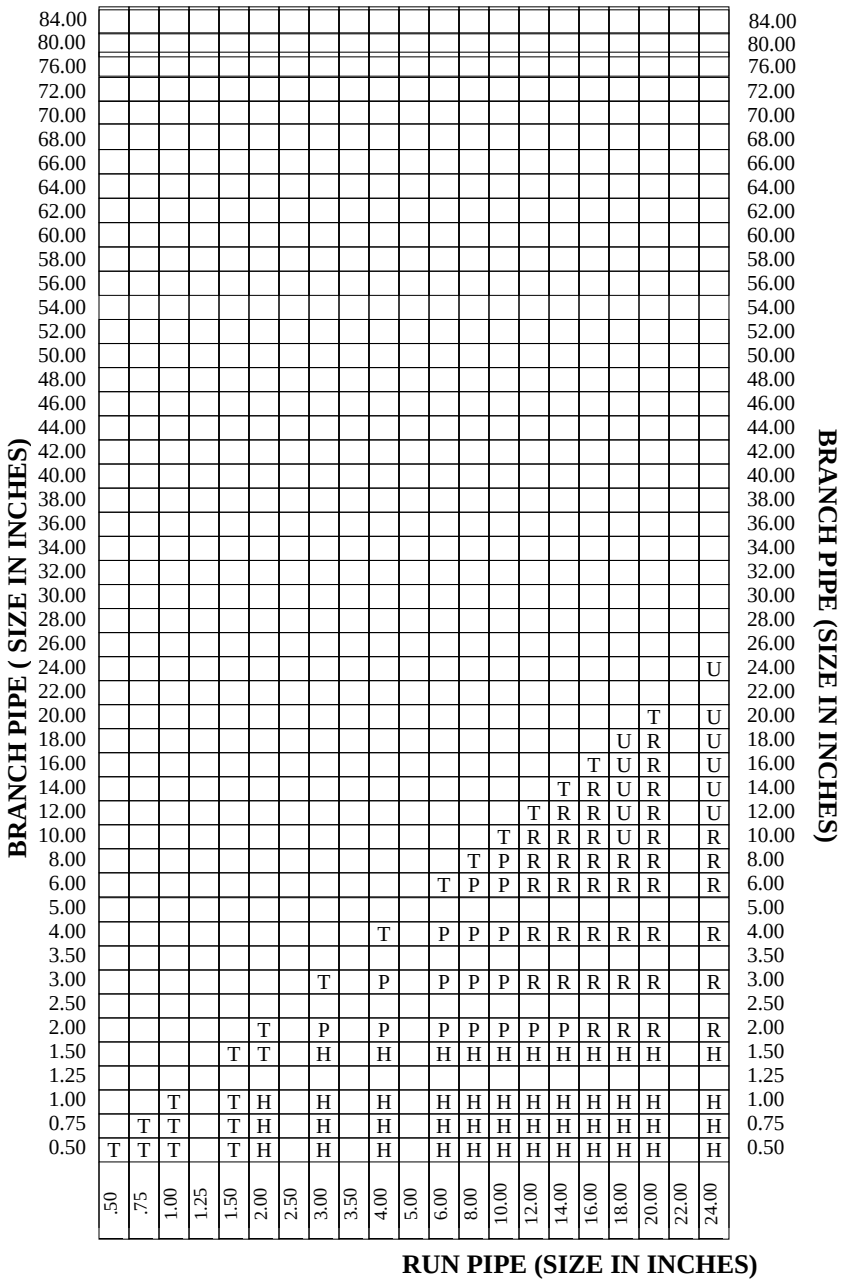
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A1K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	24	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	

Package : IPMCS
Report No. : 50

A1K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51061	51061ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51361	51361ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52061	52061ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52361	52361ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53061	53061ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53361	53361ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54361	54361ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 150,FF/125AARH	ST14131Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1N** Sheet 1 of 5

PIPE CLASS : **A1N**
RATING : 150
BASE MATERIAL : SS 316L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	16.17	16.17	13.71	12.3	11.24	10.54	9.84	8.78	7.73

SERVICE

MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE/NON FLAMMABLE & NON LETHAL.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

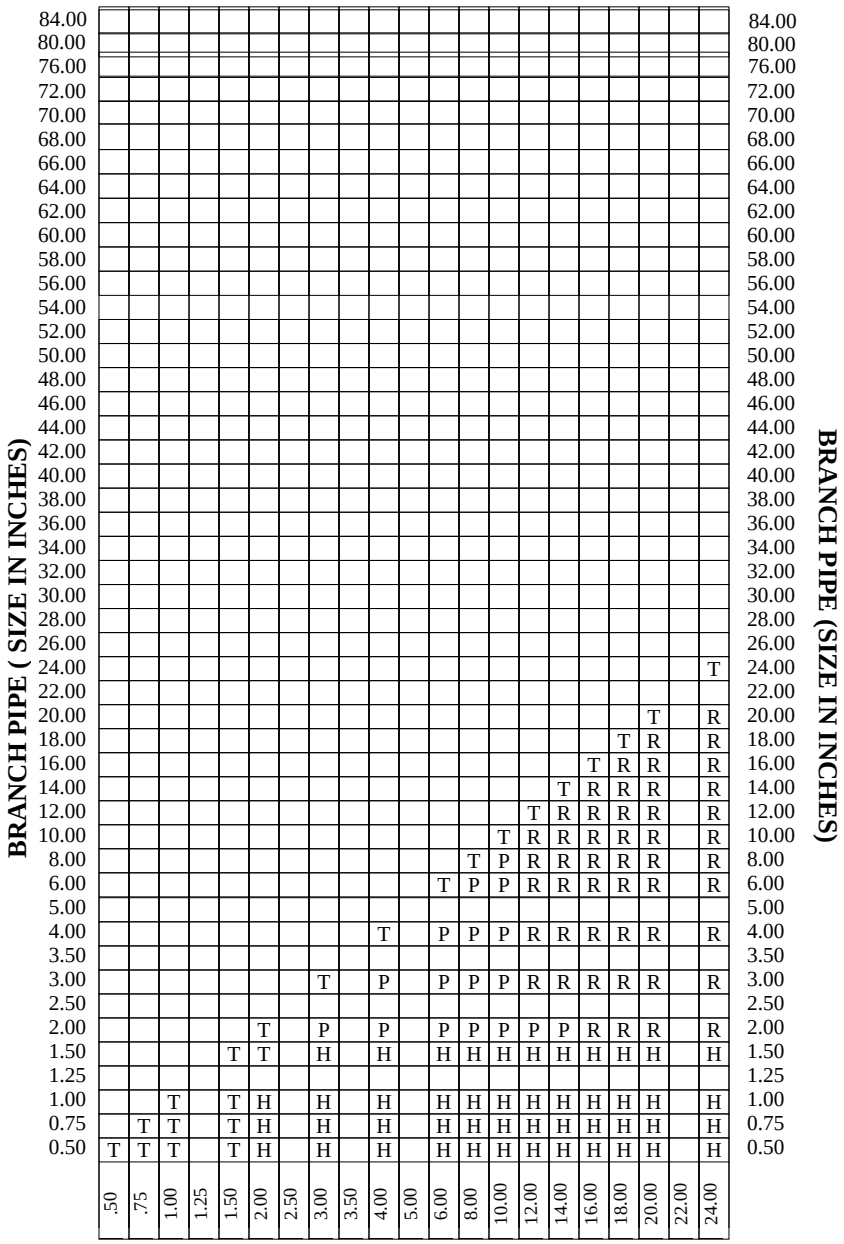
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1N** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A1N

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1N** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP316L	PE, SEAMLESS	PI34077Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP316L	PE, SEAMLESS	PI34077Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP316L	BE, SEAMLESS	PI34017Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP316L	BE, SEAMLESS	PI34017Z0	
PIP	PIPE	10	24	10S	B-36.19	ASTM A 358 TP316L CL.1	BE, E.FS.W	PI36713Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP316L	PBE, SEAMLESS	PN34067Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP316L	PBE, SEAMLESS	PN34067Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F316L	300, RF/125AARH	FSC4647Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F316L	150, RF/125AARH	FWC4627Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F316L	300, RF/125AARH	FWC4647Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F316L	150, RF/125AARH	FBC4627Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316L	150, FF/125AARH	FGK4621Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F316L	150, FF/125AARH	FCK4621Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WA647D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP316L-S	BW, 1.5D	WAGA34Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP316L-WX	BW, 1.5D	WAG864Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WB647D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP316L-S	BW, 1.5D	WBGA34Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP316L-WX	BW, 1.5D	WBG864Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WE647D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP316L-S	BW	WEGA34ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP316L-WX	BW	WEG864ZZ0	

Package : IPMCS
Report No. : 50

A1N

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1N** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WR647D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP316L-S	BW	WRGA34ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP316L-WX	BW	WRG864ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP316L-S	BW	WUGA34ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP316L-WX	BW	WUG864ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP316L-S	BW	WVGA34ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP316L-WX	BW	WVG864ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F316L	PBE	WNH476ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F316L	PBE	WPH476ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP316L-S	BW	WFGA34ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WJ647D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WK647D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WL647D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F316L	SW, 3000	WM647D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS316L	SW, 800, 3000, B-16.11, SHT NO.- 51066	51066ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR CF3M,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51366	51366ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS316L	SW, 800, 3000, B-16.11, SHT NO.- 52066	52066ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52366	52366ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53066	53066ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A1N** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53366	53366ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF3M / ASTM A 182 GR.F316L,TRIM-SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54366	54366ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP316L;INT:SS316L	CONETYPE, 150,FF/125AARH	ST14331Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F316L;INT:SS316L	SW, Y-TYPE, 800	SP316D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403WP316L-S;I:SS316L	BW, T-TYPE	SP15944Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403WP316L-WX;I:SS316L	BW, T-TYPE	SP16044Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A20K** Sheet 1 of 5

PIPE CLASS : **A20K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-48	-29	38	93	149
PRESS	19.3	19.3	19.3	16.2	14.4

SERVICE

T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP09)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.3.5 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

701 HYDROSTATIC TEST WITH WATER IS NOT PERMITTED. USE MINERAL OIL.

703 NPS 1/2 PIPING IS USED FOR MANY ALKYL LINES SO THE INTERNAL CONTAINED VOLUME IS SMALL. THESE SMALL LINES LACK THE MECHANICAL STRENGTH NECESSARY TO SUPPORT THEMSELVES ACROSS LONG SPANS (AS IN A PIPE RACK) OR TO PROVIDE PROTECTION FROM MECHANICAL DAMAGE FROM IMPACT.

704 (CONTINUED FROM NOTE 703) LONG RUNS IN THE PIPE RACKS AND PIPING THAT ARE POTENTIALLY EXPOSED TO MECHANICAL IMPACT NEED TO BE PROTECTED BY STEEL CHANNEL WITH A STRENGTH EQUAL OR GREATER THAN 4 INCH WIDTH AND WEIGHT PER FOOT OF NO LESS THAN 7.4.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

706 ONLY USE SS BODY VALVE WHEN TEMEPRATURE DESIGN IS -48°C ON T2 SERVICE.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

708 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING, AND COVER ALL EXPOSED THREADS WITH WELD.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

713 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & 2" TO 3": STR-351 IS TO BE FOLLOWED.

714 FOR PRESSURE GUAGE ASSEMBLY: FOR ALKYL SERVICE, CHEMICAL ATTACHMENTS ARE TO BE USED. DIAPHRAGM IS TO BE CONSTRUCTED OF 304 STAINLESS STEEL AND WELDED TO THE TOP HOUSING. FLUSH CONNECTION IS TO BE PROVIDED. REFER TO TYPICAL SKETCH NUMBER 26 IN THE SUPPLEMENT TO PROCESS PARTS.

715 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC. WELDED VALVES ARE PREFERRED TO MINIMIZE THE NUMBER OF POTENTIAL LEAK POINTS.

719 CHECK VLV; B16.34; CLASS 150; STD WEIGHT; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; WAFER INSERT TYPE; SEATING: PTFE; SPRING: 316 SS; REQUISITIONER MUST SPECIFY CRACKING PRESSURE;FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG; TO BE USED WITH STANDARD WEIGHT OR THINNER WALL PIPE.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

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721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

722 BALL VLV, B16.34; 1000 PSI; SW; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

723 END ENTRY; 316SS STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; 1 1/2; 3; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

727 BALL VLV, ASME B16.34; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7, 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

829 CAST; XS;WAFER INSERT TYPE; PTFE SEAT;SS316 SPRING; REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG; CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150/ CLASS 300/ CLASS 600 FLANGES;TO BE USED WITH XS OR THINNER WALL PIPE

838 CLASS 150; STANDARD WEIGHT; BAR/FORGED; STAINLESS STEEL; ASTM A 479 OR A 182 DUAL GR F316/316L; WAFER INSERT TYPE; SEATING: PTFE; SPRING: 316 STAINLESS STEEL; REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG

839 ASME B16.34/16.10 SHORT PATTERN

908 LICENSOR PMS LGP09 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

985 VALVE; BALL; ASME B16.34, CLASS 800; SOCKET WELDING; CAST; STAINLESS STEEL; ASTM A 351 GRADE CF8M; FULL PORT TYPE; 3- PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 STAINLESS STEEL STEM; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: LEVER; 1-1/2

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

990 RECOMMENDED BALL VALVE MANUFACTURES FOR USE IN T2(TEAL) SERVICE SHALL BE AS PER LICENSOR SPECIFICATION LSTD-3 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-908,28	
	ON LINES >= 2.0"	NOTE-908,28	
VENTS	ON LINES <= 1.5"	NOTE-908,28	
	ON LINES >= 2.0"	NOTE-908,28	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-908)	
PRESS.CONN	0.75"	NOTE-908,28	

Package : IPMCS

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BRANCH PIPE (SIZE IN INCHES)

BRANCH	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	BRANCH
84.00									84.00
80.00									80.00
76.00									76.00
72.00									72.00
70.00									70.00
68.00									68.00
66.00									66.00
64.00									64.00
62.00									62.00
60.00									60.00
58.00									58.00
56.00									56.00
54.00									54.00
52.00									52.00
50.00									50.00
48.00									48.00
46.00									46.00
44.00									44.00
42.00									42.00
40.00									40.00
38.00									38.00
36.00									36.00
34.00									34.00
32.00									32.00
30.00									30.00
28.00									28.00
26.00									26.00
24.00									24.00
22.00									22.00
20.00									20.00
18.00									18.00
16.00									16.00
14.00									14.00
12.00									12.00
10.00									10.00
8.00									8.00
6.00									6.00
5.00									5.00
4.00									4.00
3.50									3.50
3.00								T	3.00
2.50									2.50
2.00						T		T	2.00
1.50					T	T		T	1.50
1.25									1.25
1.00			T		T	T		S	1.00
0.75		T	T		T	T		S	0.75
0.50	T	T	T		T	S		S	0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A20K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A20K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z4	
PIP	PIPE	2	3	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
NIP/	NIPPLE	.5	1.5	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z4	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FSCD827Z4	709
FLG	FLNG.WN	.5	.5	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z4	709
FLG	FLNG.WN	2	3	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z4	709
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z4	709
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z4	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z4	
ELB90	ELBOW.90	2	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z14	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z4	
ELB45	ELBOW.45	2	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z14	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z4	
TEQ	T.EQUAL	2	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ4	
TRED	T.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z4	
TRED	T.RED	2	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ4	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ4	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ4	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ4	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ4	
CAP	CAP	2	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ4	
PLG	PLUG	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z4	307

Package : IPMCS

Report No. : 50

A20K

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A20K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z4	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z4	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z4	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z4	
O'let Group									
SLT	SOCKOLET	.5	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z4	
Valves Group									
CHV	VLV.CHECK	.75	1		ANSI-B-16.34	ASTM A182 GR. F316 / ASTM A182 GR. F316L(DUAL),TRIM-SS 316	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 533TL	533TLZZZ4	838
CHV	VLV.CHECK	1.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535YA	535YAZZZ4	829
CHV	VLV.CHECK	2	3		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 533YA	533YAZZZ4	719
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543ZA	543ZAZZZ4	722,720, 721,724, 725,990
BLV	VLV.BALL	2	3		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543YA	543YAZZZ4	723,720, 724,725, 839
BLV/2	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 540TL	540TLZZZ4	985,12,706,720,721,724
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543KA	543KAZZZ4	727,728, 720,721, 724,706, 990
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z4	988
Gasket Group									
GAS	GASKET	.5	3		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 150	GK69772Z4	711

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 1 of 6

PIPE CLASS : **A21A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	20	20	18.3	16.2	10.5

SERVICE

T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP01)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

701 HYDROSTATIC TEST WITH WATER IS NOT PERMITTED. USE MINERAL OIL.

703 NPS 1/2 PIPING IS USED FOR MANY ALKYL LINES SO THE INTERNAL CONTAINED VOLUME IS SMALL. THESE SMALL LINES LACK THE MECHANICAL STRENGTH NECESSARY TO SUPPORT THEMSELVES ACROSS LONG SPANS (AS IN A PIPE RACK) OR TO PROVIDE PROTECTION FROM MECHANICAL DAMAGE FROM IMPACT.

704 (CONTINUED FROM NOTE 703) LONG RUNS IN THE PIPE RACKS AND PIPING THAT ARE POTENTIALLY EXPOSED TO MECHANICAL IMPACT NEED TO BE PROTECTED BY STEEL CHANNEL WITH A STRENGTH EQUAL OR GREATER THAN 4 INCH WIDTH AND WEIGHT PER FOOT OF NO LESS THAN 7.4.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

708 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING, AND COVER ALL EXPOSED THREADS WITH WELD.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

713 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & 2" TO 3": STR-351 IS TO BE FOLLOWED.

714 FOR PRESSURE GUAGE ASSEMBLY: FOR ALKYL SERVICE, CHEMICAL ATTACHMENTS ARE TO BE USED. DIAPHRAGM IS TO BE CONSTRUCTED OF 304 STAINLESS STEEL AND WELDED TO THE TOP HOUSING. FLUSH CONNECTION IS TO BE PROVIDED. REFER TO TYPICAL SKETCH NUMBER 26 IN THE SUPPLEMENT TO PROCESS PARTS.

715 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC. WELDED VALVES ARE PREFERRED TO MINIMIZE THE NUMBER OF POTENTIAL LEAK POINTS.

716 CHECK VLV; ASME B16.34; CLASS 600; SCH80; BAR / FORGED: STAINLESS STEEL; ASTM A 479 OR A 182 DUAL GRADE F 316 / 316L

717 WAFER INSERT TYPE;PTFE SEAT;SS316 SPRING;REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG;CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150, CLASS 300 OR CLASS 600 FLANGES;TO BE USED WITH SCHEDULE 80 OR THINNER WALL PIPE.

718 VALVE; CHECK; ASME B16.34; CLASS 600; X-STRONG; CAST; CARBON STEEL; ASTM A 216 GRADE WCB;

719 CHECK VLV; B16.34; CLASS 150; STD WEIGHT; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; WAFER INSERT TYPE; SEATING: PTFE; SPRING: 316 SS; REQUISITIONER MUST SPECIFY CRACKING PRESSURE;FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG; TO BE USED WITH STANDARD WEIGHT OR THINNER WALL PIPE.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

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Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 2 of 6

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

722 BALL VLV, B16.34; 1000 PSI; SW; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

723 END ENTRY; 316SS STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; 1 1/2; 3; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

726 FULL PORT TYPE

727 BALL VLV, ASME B16.34; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7, 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

778 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; ASME B16.5;

839 ASME B16.34/16.10 SHORT PATTERN

857 ASME B16.34/16.10 LONG PATTERN

906 LICENSOR PMS LGP01 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

972 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; SWING TYPE; BONNETLESS; API TRIM # 8 / 8A

973 CAST; CS; BOLTING: ASTM A 193 GR B7; 316 STAINLESS STEEL STEM; SEATING: MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; 1 1/2; 3; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL

974 THIS VALVE SHALL BE USED AS PRIMARY PREFERENCE ONLY IN SIZES 2" TO 3". FOR SIZES 0.5" TO 1.5", THIS VALVE SHALL BE USED ONLY IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE/ P&ID.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

990 RECOMMENDED BALL VALVE MANUFACTURES FOR USE IN T2(TEAL) SERVICE SHALL BE AS PER LICENSOR SPECIFICATION LSTD-3 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2).

SPECIAL NOTES

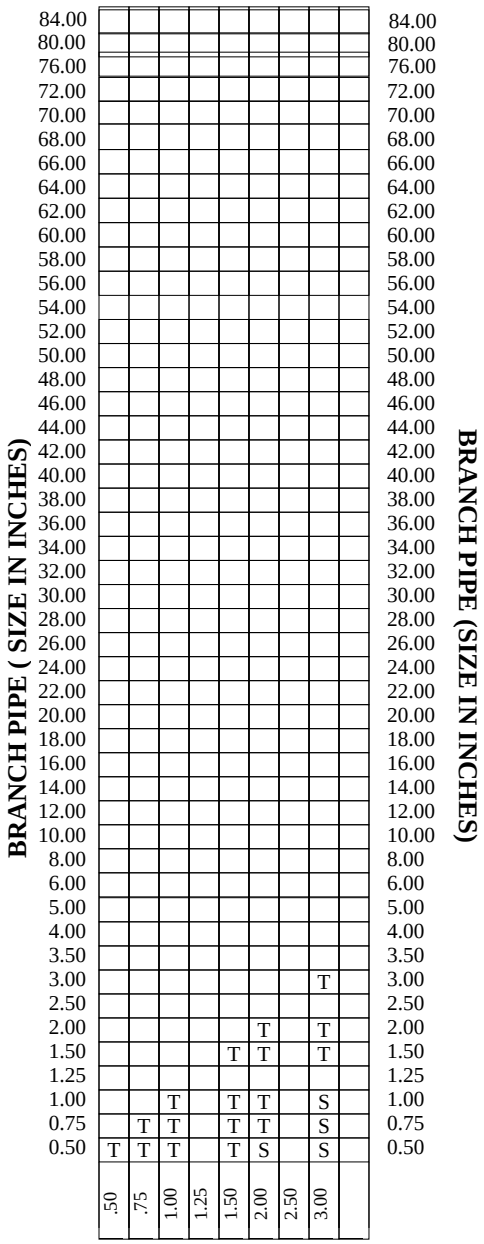
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-906	
	ON LINES >= 2.0"	NOTE-906	
VENTS	ON LINES <= 1.5"	NOTE-906	
	ON LINES >= 2.0"	NOTE-906	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-906)	
PRESS.CONN	0.75"	NOTE-906	

Package : IPMCS

Report No. : 50

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Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A21A

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Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP/	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	709
FLG	FLNG.WN	.5	.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	709
FLG	FLNG.WN	2	3	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	709
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	709
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
Valves Group									
CHV	VLV.CHECK	.5	.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530PA	530PAZZZ0	972,715
CHV	VLV.CHECK	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530PA	530PAZZZ0	972,710, 715
CHV	VLV.CHECK	2	3		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 533PA	533PAZZZ0	778,710, 715

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Location BINA, MADHYA PRADESH	**Pipe Class :A21A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV/3	VLV.CHECK	2	3		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	WAFL, 150, B-16.5, RF/125AARH, SHT NO.- 533RA	533RAZZZ0	719,705, 715
CHV/2	VLV.CHECK	1.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535RA	535RAZZZ0	718,705, 717,715
CHV/1	VLV.CHECK	.75	1		ANSI-B-16.34	ASTM A182 GR. F316 / ASTM A182 GR. F316L(DUAL),TRIM-SS 316 SEAT : RPTFE	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535RQ	535RQZZZ0	716,705, 717,715
BLV	VLV.BALL	.5	3		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PA	543PAZZZ0	723,720, 724,725, 839,974, 715
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543VA	543VAZZZ0	722,720, 721,724, 725,715, 990
BLV/3	VLV.BALL	.5	3		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543RA	543RAZZZ0	973,721, 720,724, 726,710, 715,857
BLV/2	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543UA	543UAZZZ0	722,720, 721,724, 726,710, 715,990
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543GA	543GAZZZ0	727,720, 721,724, 728,715, 990
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	3		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z0	711

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Location BINA, MADHYA PRADESH	**Pipe Class :A21K** Sheet 1 of 5

PIPE CLASS : **A21K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	-29	38	93	149	204	260	260	270
PRESS	19.3	-.6	19.3	16.2	14.4	13.4	-.6	12	11.5

SERVICE

CHEMICALS; VENTS (BASED ON LICENSOR PMS CLASS - L7C8F)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

96 VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

748 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

753 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL.

779 THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS. VALVES ARE NOT VACUUM PREPARED OR SUITABLE BY DESIGN FOR CRITICAL VACUUM AND MAY ALLOW LEAKAGE INTO THE SYSTEM.

783 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.75" TO 1.5" : STR-419 & 2" TO 8": STR-406 IS TO BE FOLLOWED.

784 VALVE; GATE; API 602; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

788 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; FULL PORT TYPE; OS&Y; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

789 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; PISTON LIFT CHECK; SPRING LOADED; HORIZONTAL TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

790 CAST; FULL PORT TYPE; BOLTING: ASTM A 193 GR B8; STAINLESS STEEL STEM; SEATING: GRAPHITE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER-UPTO 4" & WEATHERPROOF GEAR-ABOVE 4".

796 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE UPTO 4" AND ALSO EXTENDED HANDLE LENGTH SHALL BE SPECIFIED.

901 LICENSOR PMS L7C8F SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

914 SHORT PATTERN

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971 VALVE; GATE; API 602; CLASS 800; PLAIN END X NPTF; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; EXTENDED BODY; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

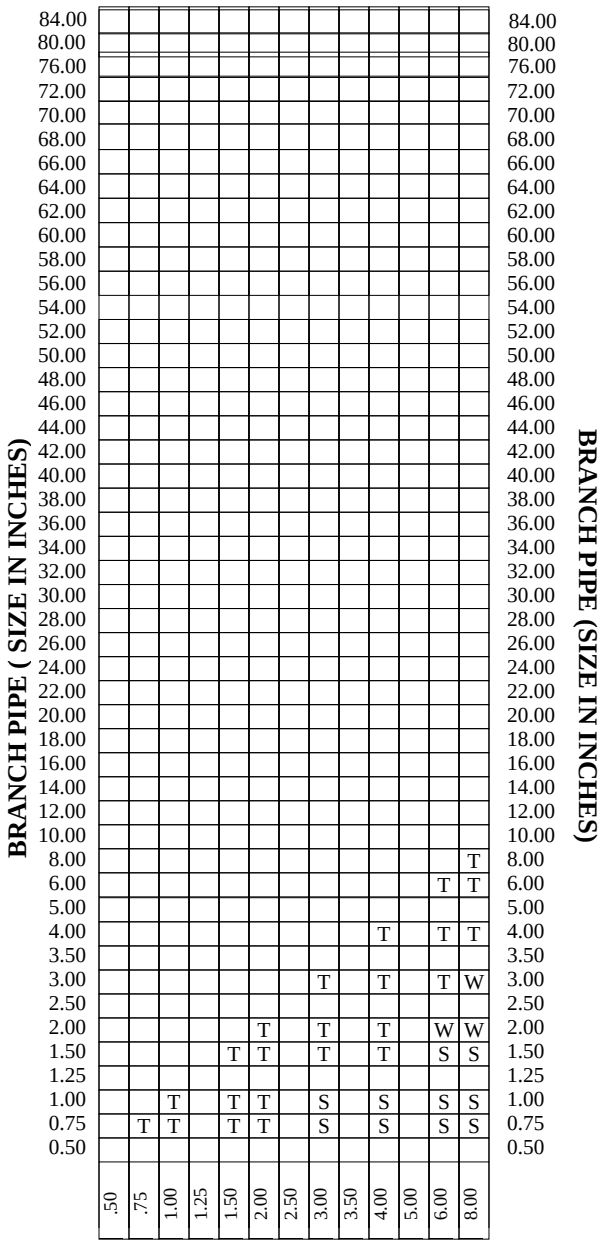
988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-901	
	ON LINES >= 2.0"	NOTE-901	
VENTS	ON LINES <= 1.5"	NOTE-901	
	ON LINES >= 2.0"	NOTE-901	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-901)	
PRESS.CONN	0.75"	NOTE-901	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A21K

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Location BINA, MADHYA PRADESH	**Pipe Class :A21K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FSCD827Z0	709
FLG	FLNG.WN	2	8	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z0	709
FLG/150	FLNG.LJ	2	8		B-16.5	ASTM A 105	150, STK/MAX1000AARH	FLC012EZ0	709,710
FLB	FLNG.BLIND	.75	8		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z0	709
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z0	
Fitting Group									
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	

Package : IPMCS
Report No. : 50

A21K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	
STB	STUB.END	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 125AARH	WSGU741Z0	914
O'let Group									
SLT	SOCKOLET	.75	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
WLT	WELDOLET	2	8	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.-510PM	510PMZZZ0	784,742
GAV	VLV.GATE	2	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513PM	513PMZZZ0	788,742
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SPCL, 800, 3000, B-1.20.1, REFER VMS SHT, SHT NO.- 510YM	510YMZZZ0	971,728
CHV	VLV.CHECK	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.-530PM	530PMZZZ0	789,742
CHV	VLV.CHECK	2	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533PM	533PMZZZ0	748,742
BLV	VLV.BALL	.75	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PM	543PMZZZ0	790,742, 753,796
Bolt Group									
BOS	BOLT.STUD	.75	8		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.75	8		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 150	GK69772Z0	711

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21P** Sheet 1 of 4

PIPE CLASS : **A21P**
RATING : 150
BASE MATERIAL : ALLOY 20
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	20.39	20.39	18.28	16.17

SERVICE

SULFURIC ACID

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

111 USE STABILIZED ANNEALED MATERIAL ONLY.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTENANCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP. CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS. CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21P** Sheet 2 of 4

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	
84.00								84.00
80.00								80.00
76.00								76.00
72.00								72.00
70.00								70.00
68.00								68.00
66.00								66.00
64.00								64.00
62.00								62.00
60.00								60.00
58.00								58.00
56.00								56.00
54.00								54.00
52.00								52.00
50.00								50.00
48.00								48.00
46.00								46.00
44.00								44.00
42.00								42.00
40.00								40.00
38.00								38.00
36.00								36.00
34.00								34.00
32.00								32.00
30.00								30.00
28.00								28.00
26.00								26.00
24.00								24.00
22.00								22.00
20.00								20.00
18.00								18.00
16.00								16.00
14.00								14.00
12.00								12.00
10.00								10.00
8.00								8.00
6.00								6.00
5.00								5.00
4.00								4.00
3.50								3.50
3.00								3.00
2.50								2.50
2.00						T		2.00
1.50					T	T		1.50
1.25								1.25
1.00			T		T	H		1.00
0.75		T	T		T	H		0.75
0.50	T	T	T		T	H		0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A21P

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21P** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PE, SEAMLESS	PI3D277Z0	111
PIP	PIPE	1	1.5	40S	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PE, SEAMLESS	PI3D277Z0	111
PIP	PIPE	2	2	40S	B-36.19	ASTM B 729 ANNLD (UNS N08020)	BE, SEAMLESS	PI3D217Z0	111
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PBE, SEAMLESS	PN3D267Z0	111
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM B 462 UNS N08020	150, RF/125AARH	FSCG527Z0	111
FLG	FLNG.WN	2	2	M	B-16.5	ASTM B 462 UNS N08020	150, RF/125AARH	FWCG527Z0	111
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM B 462 UNS N08020	150, RF/125AARH	FBCG527Z0	111
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM B 462 UNS N08020	150, FF/125AARH	FGKG521Z0	111
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WA6AFD2Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW, 1.5D	WAGC84Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WB6AFD2Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW, 1.5D	WBGC84Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WE6AFD2Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WEGC84ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WR6AFD2Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WRGC84ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM B 462 UNS NO8020	PBE	WNHAF6ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM B 462 UNS NO8020	PBE	WPHAF6ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WFGC84ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WJ6AFD2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21P** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WK6AFD2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WL6AFD2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WM6AFD2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 510DR	510DRZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 520DR	520DRZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 530DR	530DRZZZ0	
BLV	VLV.BALL	.5	1.5		BS EN ISO 17292	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543DR	543DRZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND UNS N08020+PTFE	SPIRAL, 150	GK6CF72Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21Y** Sheet 1 of 3

PIPE CLASS : **A21Y**
RATING : 150
BASE MATERIAL : MISCELLANEOUS
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	17.57	17.57	16.52	15.11

SERVICE

CATALYST CHEMICALS (REFER LICENSOR PMS CLASS - 72C1)

NOTES

643 FOR THIS SPEC REFER LICENSOR CLASS 72C1

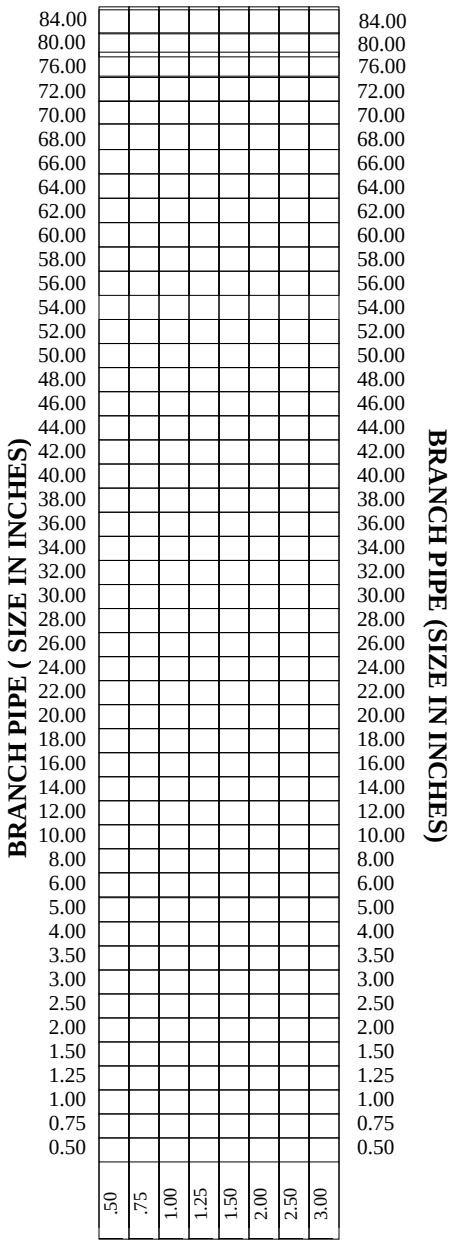
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21Y** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A21Y

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A21Y** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 1 of 6

PIPE CLASS : **A23K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	-29	65	110	110	190
PRESS	-.5	3.16	3.5	-.5	3.16	3.5

SERVICE

RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - L7A1)

NOTES

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

311 USE FOR ONLY THERMOWELL CONNECTION.

862 ALL PIPE & JOINTS, INCLUDING EQUIPMENT CONNECTIONS & ADJACENT GAS ONLY PIPING, SHALL BE ELECTRICALLY BONDED & GROUNDED. FLANGES & COUPLINGS MUST BE ELECTRICALLY BONDED WITH 4 AWG COPPER GROUNDING CONDUCTOR. GROUNDING IS REQUIRED EVERY 200 FT(61 M). WELD A TAB TO PIPING ON EACH SIDE OF FLANGED JOINT.

885 THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS

888 PICKLED & PASSIVATED.

889 GALVANIZED AS PER ASTM A 123.

890 FOR SIZES 10" TO 36", MITER BENDS SHALL BE DESIGNED IN ACCORDANCE WITH PARAGRAPH 304.2.3 AND 304.2.4 OF ASME B31.3 PROCESS PIPING CODE - CURRENT EDITION; BEND RADIUS SHALL BE CONSIDERED IN SPECIFIED DIAMETRS AS MENTIONED IN THE PROCESS DESIGN PACKAGE / P & ID AND SCHEDULE TO BE AS PER DESIGN.

891 SILICONE RUBBER; FOOD GRADE MATERIAL (FDA APPROVED); WHITE; THICKNESS: 1/8 INCH; MAXIMUM SHORE A HARDNESS 60.
SHALL BE USED ONLY FOR PPU UNIT; DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

900 LICENSOR PMS L7A1 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

914 SHORT PATTERN

915 EPDM; WHITE; THICKNESS: 1/8 INCH; MAXIMUM SHORE A HARDNESS 60.
SHALL BE USED ONLY FOR UNIVATION SWING UNIT; DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS.

925 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP FOR PPU UNIT AND IN ACCORDANCE WITH POD-CS-PE OR PP FOR UNIVATION SWING UNIT.

983 FOR DISC BLIND ASSEMBLY DETAILS, REFER LSTD-4 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2) ALONG WITH LICENSOR SPECIFICATION L7A1.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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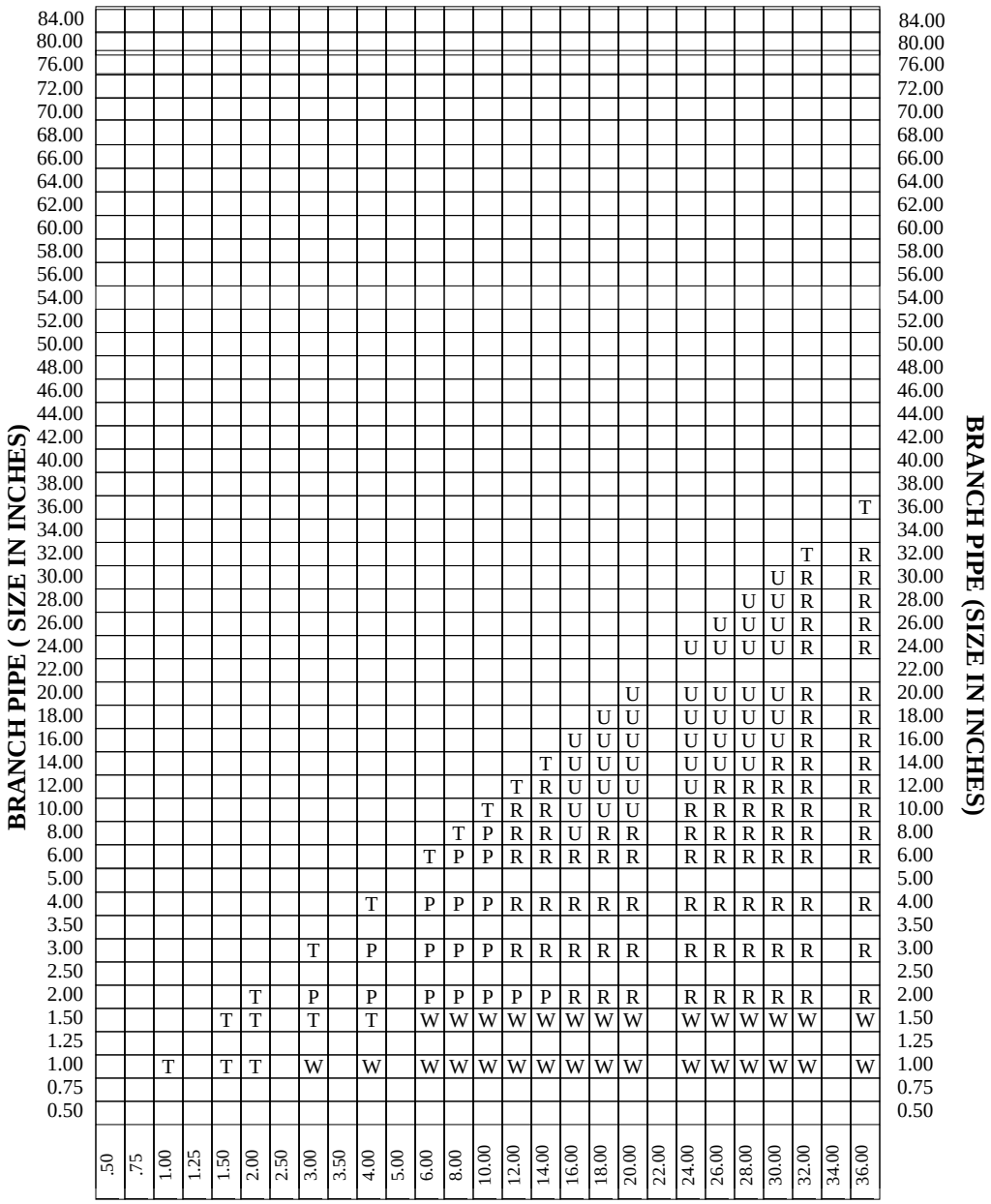
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-900	
	ON LINES >= 2.0"	NOTE-900	
VENTS	ON LINES <= 1.5"	NOTE-900	
	ON LINES >= 2.0"	NOTE-900	
TEMP.CONN		REFER LICENSOR SPEC. LPPF-10 (NOTE-900) FOR PPU UNIT & REFER LICENSOR SPEC. PPF-10 FOR SWING UNIT	
PRESS.CONN	0.75"	NOTE-900	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 3 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A23K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	2	2	5S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	3	8	5S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	10	24	5S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z0	888
PIP	PIPE	26	28	6.35	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z0	888
PIP	PIPE	30	30	5S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z0	888
PIP	PIPE	32	36	9.53	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z0	888
Flange Group									
FLG	FLNG.WN	26	36	M	B-16.47-A	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWAD827Z0	
FLG	FLNG.LJ	1	24		B-16.5	ASTM A 105(GALV.)	150, STK/MAX1000AARH	FLC072EZ0	889
FLB	FLNG.BLIND	1	24		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z0	
FLB	FLNG.BLIND	26	36		B-16.47-A	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBAD827Z0	
FEF	FLNG.FIG.8	1	8		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FCKD821Z0	
Fitting Group									
ELB90	ELBOW.90	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB90	ELBOW.90	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z10	
ELB90	ELBOW.90	32	36	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z10	
ELB45	ELBOW.45	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
ELB45	ELBOW.45	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z10	

Package : IPMCS
Report No. : 50

A23K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	32	36	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z10	
TEQ	T.EQUAL	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TEQ	T.EQUAL	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ0	
TEQ	T.EQUAL	32	36	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ0	
TRED	T.RED	1	1.5	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
TRED	T.RED	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ0	
TRED	T.RED	32	36	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ0	
REDC	REDUC.CONC	1	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDC	REDUC.CONC	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ0	
REDC	REDUC.CONC	32	36	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ0	
REDE	REDUC.ECC	1	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
REDE	REDUC.ECC	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ0	
REDE	REDUC.ECC	32	36	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ0	
CAP	CAP	1	30	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
CAP	CAP	32	36	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
STB	STUB.END	1	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 125AARH	WSGU741Z0	914
STB	STUB.END	10	24	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 125AARH	WSGU841Z0	914

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A23K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
WLT	WELDOLET	1	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YESU64ZZ0	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YLSU64ZZ0	311
Bolt Group									
BOS	BOLT.STUD	1	36		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	1	24		B-16.21-ANSI B16.5	WHITE SILICON RUBBER	FULLFACE, 150, 3 MM	GKBAE22Z0	891
GAS	GASKET	30	36		B-16.21-ANSI B16.47A	WHITE SILICON RUBBER	FULLFACE, 150, 3 MM	GK9AE22Z0	891
GAS/150	GASKET	1	24		B-16.21-ANSI B16.5	EPDM WHITE (SHORE A-60)	FULLFACE, 150, 3 MM	GKBEA22Z0	915
GAS/150	GASKET	26	36		B-16.21-ANSI B16.47A	EPDM WHITE (SHORE A-60)	FULLFACE, 150, 3 MM	GK9EA22Z0	915

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24A** Sheet 1 of 6

PIPE CLASS : **A24A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	-29	38	93	149	204	260
PRESS	-1	20	20	18.3	16.2	14.1	12

SERVICE

HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP08)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

96 VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

732 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS ENGINEER PER ASME B31.3 PARAGRAPH 301.5.4. (CONT.)

733 (CONT. FROM NOTE NO. 732) IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

755 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM;BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

759 PRESSURE PULSATING SERVICES LIKE RECIPROCATING COMPRESSOR PIPING, PIPE SUPPORT LOCATIONS MUST BE DETERMINED IN CONCERT WITH ANALOG TECHNOLOGIST TO AVOID HARMONICS DUE TO VIBRATION & WITH PIPING STRESS ANALYST TO AVOID EXCESS THERMAL STRESS/STRAIN. HOLD DOWN TYPE SUPPORTS WILL TYPICALLY BE REQUIRED.

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760 IN ORDER TO ELIMINATE THE OCCURRENCE OF POTENTIAL STRESS RISERS DETRIMENTAL TO PIPING IN CYCLIC SERVICES, EXTRA CARE MUST BE TAKEN DURING FABRICATION. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO WELDING. WHEREVER POSSIBLE, THE INSIDE SURFACE OF BUTT WELDS SHALL BE GROUND FLUSH.

761 ALL INTERNAL WELD SPLATTER AND BURRS SHALL BE REMOVED. THE GTAW WELD PROCESS SHALL BE USED FOR THE ROOT PASS OF ALL BUTT WELDS TO PROMOTE A SMOOTH INNER BORE; ROOT PENETRATION SHALL BE KEPT TO A MINIMUM.

762 ALL HOLES FOR (SET-ON STYLE) "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING, OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE; A STRAIGHT BORE OLET IS REQUIRED FOR THESE APPLICATIONS.

773 FOR PIPING SYSTEMS SUBJECT TO VIBRATION, BRACING OF PERMANENT VENTS AND DRAINS SHOULD BE CONSIDERED

775 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

779 THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS. VALVES ARE NOT VACUUM PREPARED OR SUITABLE BY DESIGN FOR CRITICAL VACUUM AND MAY ALLOW LEAKAGE INTO THE SYSTEM.

781 VALVE; BALL; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; BOLTING: ASTM A 193 GR B7; HARDENED STAINLESS STEEL STEM; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: WEATHERPROOF GEAR

786 8-THREAD SERIES BOLTS ARE REQUIRED WHEN THE FLANGE BOLT DIAMETER IS 1 1/8 INCH OR LARGER PER ASTM A 193; THE PREFERRED INSTALLATION IS WITH THE STEM IN THE HORIZONTAL POSITION.

787 (CONT. FROM NOTE NO. 786) VALVE SHALL BE BI-DIRECTIONAL AND CAPABLE OF DEAD END SERVICE AT FULL-RATED PRESSURE. PRIOR TO INSTALLATION ASSURE THAT FLANGE GASKET FACE INCLUDING THE RETAINER RING AND BOLTING ARE SUITABLE TO PROVIDE SEALING WITH THE SELECTED GASKET.

791 VALVE; GATE; API 602; CLASS 800; BUTT WELDING X NPTF; FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: WELDED; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

826 DOUBLE FLGD; CAST; BOLTING: ASTM A 193 GR B7; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; SS STEM; SEATING: METAL; SEATING RING: METAL OR METAL/GRAPHITE; CARBON STEEL DISC; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: WEATHERPROOF GEAR; ASME B16.5/B16.47 SERIES A;

845 THIS PIPE SPECIFICTION MAY BE USED FOR DESIGN CONDITIONS DOWN TO -29 DEGREE C (-20 DEGREE F) ONLY AT LOCATIONS WHERE CARBON STEEL IS NOT RESTRICTED TO A MINIMUM TEMPERATURE OF -10 DEGREE C (14 DEGREE F).

847 AT UNAVOIDABLE THREADED EQUIPMENT CONNECTIONS ONLY, SEAL WELD A MINIMUM LENGTH NIPPLE (THREADED ONE END) INTO THE THREADED CONNECTION ON EQUIPMENT. SEAL WELD SHALL COVER ALL EXPOSED THREADS. WELD A FLANGE TO THE OUTBOARD END OF THE NIPPLE. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING IS PERFORMED.

849 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.75" TO 1.5": STR-370 & 0.75" TO 10": STR-351 IS TO BE FOLLOWED.

852 CAST; CARBON STEEL; ASTM A 216 GRADE WCB; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM # 8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 10, GEAR LARGER SIZES

853 VALVE; GLOBE; ASME B16.34; CLASS 800; BUTT WELDING, SCHEDULE MATCH TO PIPE; FORGED; CARBON STEEL; ASTM A 105; OS&Y; BONNET: WELDED; RISING STEM; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

854 ASME B16.34/16.10 SHORT PATTERN; CAST; REDUCED PORT TYPE; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; SS STEM; SEATING: METAL; NICKEL PLATED SS316 BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER UPTO 4" & WEATHERPROOF GEAR ABOVE 4"

907 LICENSOR PMS LGP08 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

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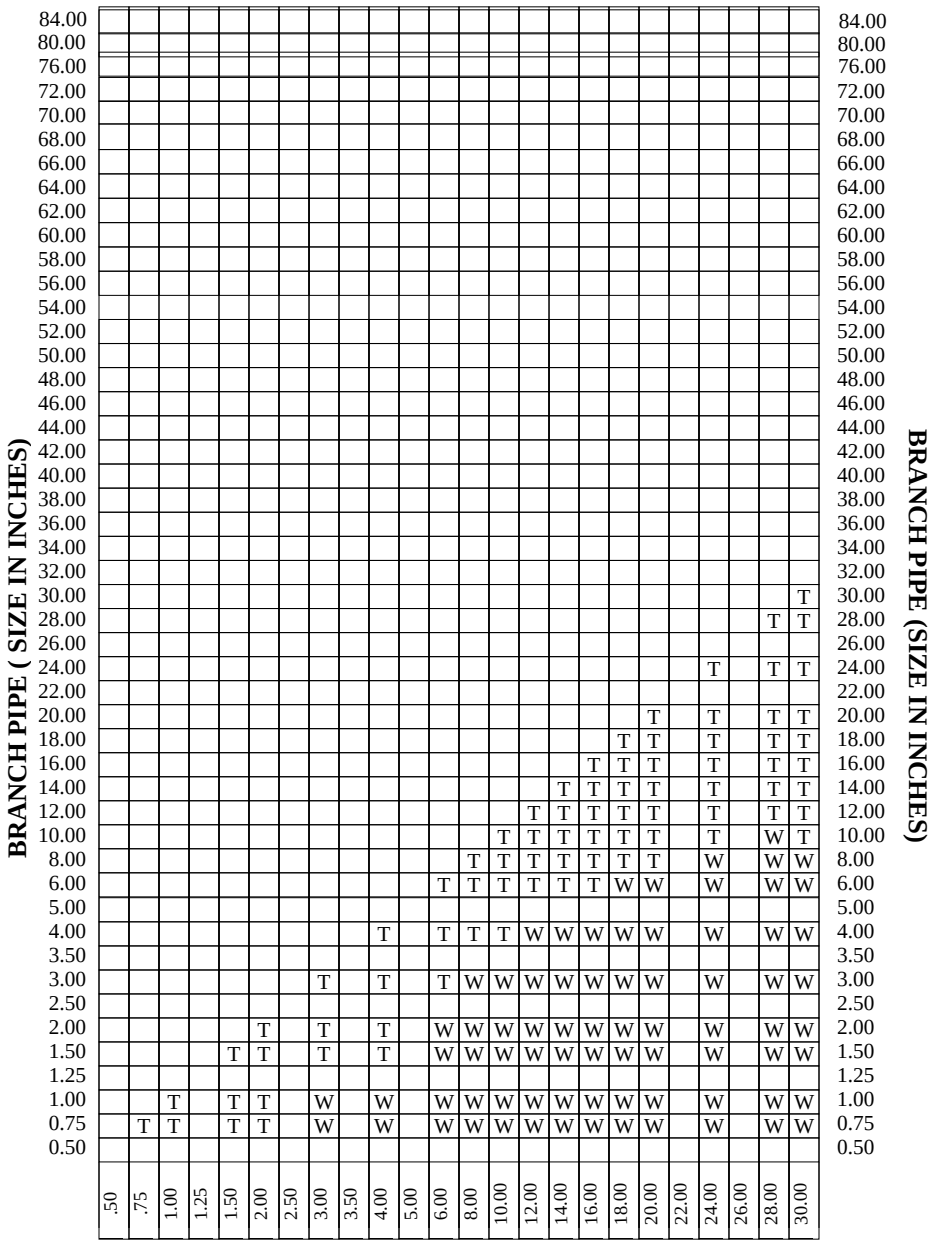
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Location BINA, MADHYA PRADESH	**Pipe Class :A24A** Sheet 3 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-907	
	ON LINES >= 2.0"	NOTE-907	
VENTS	ON LINES <= 1.5"	NOTE-907	
	ON LINES >= 2.0"	NOTE-907	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-907)	
PRESS.CONN	0.75"	NOTE-907	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A24A

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
NIP/	NIPPLE	.75	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	847
Flange Group									
FLG	FLNG.WN	.75	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.75	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A24A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	.75	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
O'let Group									
WLT	WELDOLET	.75	12	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513UB	513UBZZZ0	755,725, 742
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513PB	513PBZZZ0	852,742
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510PB	510PBZZZ0	791,725, 728,742
GLV	VLV.GLOBE	.75	.75		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 520PB	520PBZZZ0	853,742
GLV	VLV.GLOBE	1	1.5		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523PB	523PBZZZ0	775,742
BLV	VLV.BALL	.75	10		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PB	543PBZZZ0	854,720, 724,742
BLV	VLV.BALL	12	20		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PB	543PBZZZ0	781,726, 742
BFV	VLV.BTRFLY	3	24		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,STEM-STAINLESS STEEL,DISC-CARBON STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 563PB	563PBZZZ0	826,742, 786,787
Bolt Group									
BOS	BOLT.STUD	.75	24		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.75	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z0	711

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 1 of 8

PIPE CLASS : **A24K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	19.3	19.3	16.2	14.4	10.5

SERVICE

CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE (BASED ON LICENSOR PMS CLASS - LGP41)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

730 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH

737 GROOVED METAL SS316L(UNS S31603); FLEXIBLE GRAPHITE; GROOVED FLAT PROFILE METALLIC CORE(4 MM) WITH SOFT GASKET SEALING MATERIAL ON EITHER FACE(0.50 MM EACH). LOOSE LOCATING RING, SS316L(UNS S31603); TO BE USED IF SPECIFIED IN PROCESS DESIGN PACKAGE/ P&ID: DON'T APPLY LUBRICANT OR ANTI-SEIZE COMPOUND

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

769 VALVES CAN BE USED IN APPLICATIONS EITHER WITH CHLORIDE STRESS CRACKING CONSIDERATIONS OR WITHOUT CHLORIDE STRESS CRACKING CONSIDERATIONS.

800 REQUISITIONER MUST SPECIFY CRACKING PRESSURE FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG;

804 FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

830 ASME B16.34/16.10 SHORT PATTERN; CAST; REDUCED PORT TYPE; END ENTRY; SS316 STEM; SEATING: MOLECULARLY ENHANCED PTFE; SS316 BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL

837 8-THREAD SERIES BOLTS ARE REQUIRED WHEN THE FLANGE BOLT DIAMETER IS 1 1/8 INCH OR LARGER PER ASTM A 193; THE PREFERRED INSTALLATION IS WITH THE STEM IN THE HORIZONTAL POSITION.

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859 VALVE; GATE; API 602; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

860 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: INTEGRAL; API TRIM #10; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 10, GEAR LARGER SIZES;

864 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 6, GEAR LARGER SIZES;

865 STANDARD WEIGHT; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M OR ASTM A 479 GR 316 / 316L ; WAFER INSERT TYPE; SEATING: PTFE; SPRING: 316 STAINLESS STEEL; TO BE USED WITH STANDARD WEIGHT OR THINNER WALL PIPE

866 VALVE; CHECK; API 594; RAISED FACE; TAPPED LUG OR DOUBLE FLG; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; DUAL-PLATE WAFER-LUG STYLE; API TRIM #10; 316 STAINLESS STEEL DISC; SPRING: INCONEL-X; ASME B16.5;

867 1000 PSI; CAST; SS; 3-PIECE BODY; BOLTING: ASTM A 193 GR B8; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); OPERATOR: LEVER; WELD-IN BODY CAPS SHALL BE ASTM A 182 GR F316L, A 479 TYPE 316L OR A 351 GR CF3M.

870 ASME B16.34/16.10 SHORT PATTERN; CAST; REDUCED PORT TYPE; END ENTRY; SS316 STEM; SEATING: MOLECULARLY ENHANCED PTFE; SS316 BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: WEATHERPROOF GEAR; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL

872 RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; TRUNNION MOUNTED; BOLTING: ASTM A 193 GR B8; 316 STAINLESS STEEL STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: WEATHERPROOF GEAR;

873 DOUBLE FLANGED; CAST; BOLTING: ASTM A 193 GR B8; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; STAINLESS STEEL STEM; SEATING: 316 STAINLESS STEEL; SEATING RING: METAL OR METAL / GRAPHITE; 316 STAINLESS STEEL DISC; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: WEATHERPROOF GEAR;

874 RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; 316 STAINLESS STEEL PLUG; PACKING: FLEXIBLE GRAPHITE-PTFE; DIAPHRAGM: PTFE OR PFA; SLEEVE: PTFE; BACK UP DIAPHRAGM: STAINLESS STEEL; OPERATOR: WRENCH;

875 RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; 316 STAINLESS STEEL PLUG; PACKING: FLEXIBLE GRAPHITE-PTFE; DIAPHRAGM: PTFE OR PFA; SLEEVE: PTFE; BACK UP DIAPHRAGM: STAINLESS STEEL; OPERATOR: WEATHERPROOF GEAR;

878 IN AREAS SUBJECT TO CHLORIDE STRESS CRACKING REFER LICENSOR PMS LGP41 FOR VALVE SPECIFICATION

882 PLAIN END X NPTF; FORGED; STAINLESS STEEL; ASTM A 182 GR F316L; EXTENDED BODY; OS&Y; RISING STEM; BONNET: WELDED; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

888 PICKLED & PASSIVATED.

914 SHORT PATTERN

940 LICENSOR PMS LGP41 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

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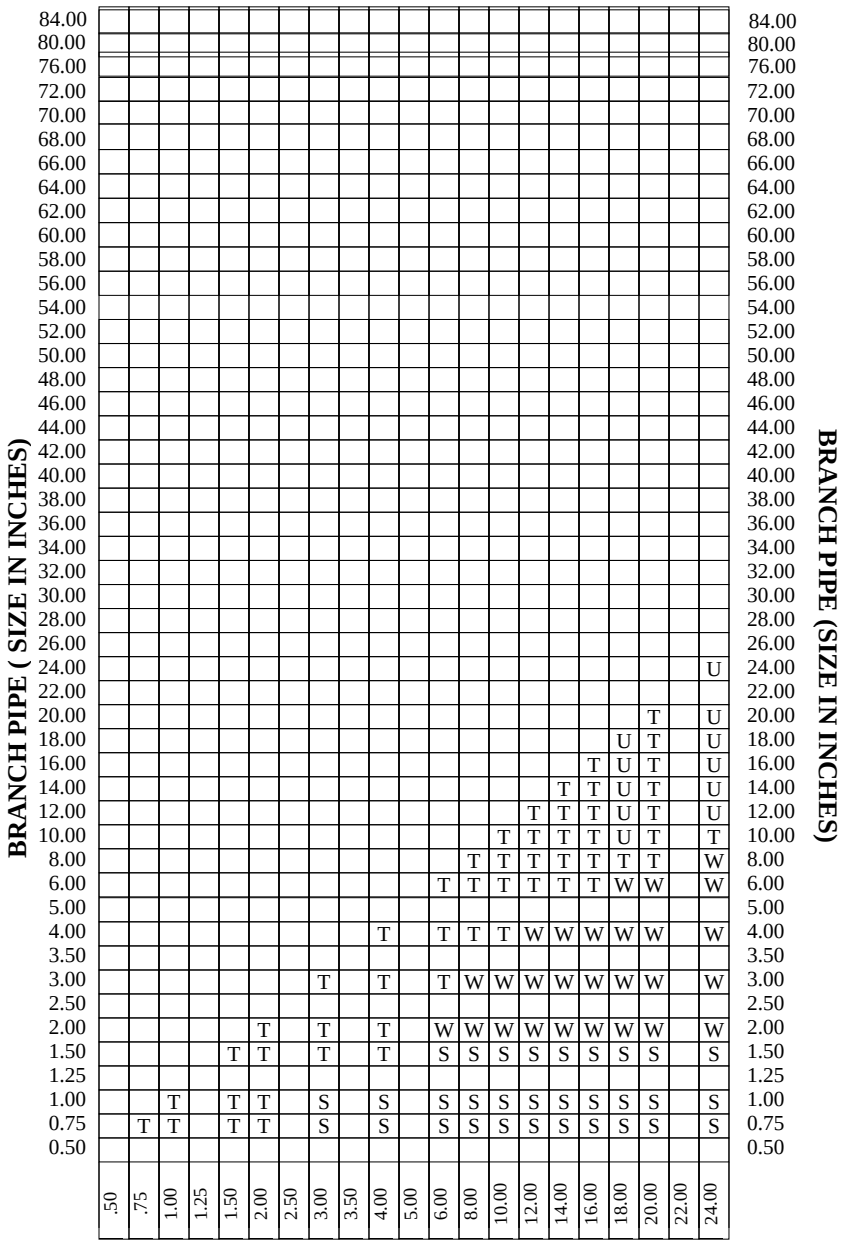
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 3 of 8

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-940	
	ON LINES >= 2.0"	NOTE-940	
VENTS	ON LINES <= 1.5"	NOTE-940	
	ON LINES >= 2.0"	NOTE-940	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-940)	
PRESS.CONN	0.75"	NOTE-940	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A24K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 5 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	10	24	10S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z0	888
NIP/	NIPPLE	.75	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FSCD827Z0	
FLG	FLNG.WN	.5	.5	40S	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z0	
FLG/150	FLNG.LJ	2	24		B-16.5	ASTM A 105	150, STK/MAX1000AARH	FLC012EZ0	710
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FCKD821Z0	
Fitting Group									
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z10	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z10	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	

Package : IPMCS
Report No. : 50

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Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 6 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ0	
TRED	T.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	
STB	STUB.END	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 125AARH	WSGU741Z0	914
STB	STUB.END	10	24	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 125AARH	WSGU841Z0	914
O'let Group									
SLT	SOCKOLET	.75	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
WLT	WELDOLET	2	12	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	

Package : IPMCS
Report No. : 50

A24K

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 7 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 510PP	510PPZZZ0	859,725, 769,742
GAV	VLV.GATE	2	24		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513PP	513PPZZZ0	860,726, 743,878, 742
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SPCL, 800, 3000, B-1.20.1, REFER VMS SHT, SHT NO.- 510KP	510KPZZZ0	882,725, 728
GLV	VLV.GLOBE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 520PP	520PPZZZ0	804,743, 878,742
GLV	VLV.GLOBE	2	24		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523PP	523PPZZZ0	864,743, 878,742
CHV	VLV.CHECK	.75	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 530PP	530PPZZZ0	865,705, 800,769, 742
CHV	VLV.CHECK	2	24		API-594	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 533PP	533PPZZZ0	866,705, 742,769
BLV	VLV.BALL	.75	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 543KP	543KPZZZ0	867,720, 721,724, 725,743, 878,742
BLV	VLV.BALL	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PP	543PPZZZ0	830,724, 730,742, 769
BLV	VLV.BALL	6	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PP	543PPZZZ0	870,724, 769,742
BLV	VLV.BALL	10	24		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316 SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543LL	543LLZZZ0	872,725, 724,743, 878,742
PLV	VLV.PLUG	.75	3		BS-5353	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 553PP	553PPZZZ0	874,724, 730,743, 878,742
PLV	VLV.PLUG	4	18		BS-5353	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 553PP	553PPZZZ0	875,724, 743,878, 742
BFV	VLV.BTRFLY	3	24		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 563PP	563PPZZZ0	873,724, 837,743, 878,742
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A24K** Sheet 8 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 150	GK69772Z0	711
GAS/150	GASKET	.5	24		B-16.20-ANSI B16.5	SS 316L	RING, 150, 5 MM	GK67552Z0	737

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A27K** Sheet 1 of 5

PIPE CLASS : **A27K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	177
PRESS	10.5	10.5

SERVICE

DENSE/DILUTE PHASE CONVEYING; ADDITIVE CONVEYING (BASED ON LICENSOR PMS CLASS - 7C50)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

324 KNIFE GATE VALVE; SPECIAL BOLTS FOR CONNECTION WITH PIPING SHOULD BE SUPPLIED BY VALVE MANUFACTURER.

344 ALL PIPE AND JOINTS, INCLUDING ADJACENT SECTIONS OF GAS ONLY PIPING, TO BE BONDED AND GROUNDED. BONDING IS NOT REQUIRED FOR CARBON BLACK OR CALCIUM CARBONATE SERVICES.

350 VICTAULIC GR. L (COUPLING GASKET) & MNF STD. BOLTING SHOULD BE FURNISHED WITH COUPLING.

351 ELBOWS ARE LIMITED TO USE IN VENT LINES AND AT THE TERMINATION OF CONVEYING LINES.

352 UNIBODY DESIGN; DO NOT SEAL WELD.

353 IN CASE TEMPERATURE IS OVER 82 DEG C, USE MIS/1.

354 DO NOT USE "IN LINE" FOR CONVEYING.

359 THIRTY (30) PIPE DIAMETERS SHOULDBE PROVIDED BET. SOLIDS INTRODUCTION POINT AND THE FIRST BEND. 20 PIPE DIA. (MIN.) SHOULD BE MAINTAINED BET. BENDS. (CONTD.)

360 ONLY VERTICAL & HORIZONTAL PIPE SHOULD BE USED; AVOID DIAGONAL SECTIONS. IF A DIAGONAL SECTION IS REQ., IT SHOULD NOT EXCEED 10 FEET IN LENGTH AND SHOULD NOT BE ANY STEEPER THAN 30 DEG. FROM HORIZONTAL.(CONTD.)

361 IDEALLY, REDUCERS INSTALLED IN THE PIPE SHOULD BE LOCATED IN A VERTICAL SECTION OF LINE AND PLACED AT LEAST 10 PIPE DIAMETERS FROM ANY BEND.

362 PRESURE TEMPERATURE LIMITATIONS OF THIS PIPING CLASS IS AS FOLLOWS:- FOR SIZE 0.5" TO 3": AT -29 DEG.C TO 177 DEG.C , PRESSURE 16 INHG VACCUUM TO 10.5 KG/CM2.

363 PRESURE TEMPERATURE LIMITATIONS OF THIS PIPING CLASS IS AS FOLLOWS:- FOR SIZE 4" TO 14": AT -29 DEG.C TO 177 DEG.C , PRESSURE 16 INHG VACCUUM TO 8.8 KG/CM2.

378 NOTES SPECIFIED IN LICENSOR SPECIFICATION 7C50 TO BE REFFERED FOR THIS CLASS.

414 VICTAULIC COUPLING IS TO BE USED. VICTAULIC GR.L (COUPLING GASKET) & MFR STD. BOLTING SHOULD BE FURNISHED WITH COUPLING. FOR TYE OF VICTAULIC COUPLING USED IN VARIOUS SIZES, REFER NOTE NO. 415

415 VICTAULIC STYLE COUPLING 77 FOR SIZE 1", STYLE 75 FOR 1.5"-8", STYLE 77 FOR 10"-14". MATERIAL SHALL BE A536 GR. 65-45-12 REF. TO MNF STD.

528 DUAL STAMP SHALL BE REQUIRED FOR ALL MATERIALS WHERE 2 GRADES OF MATERIAL ARE REQUIRED.

557 SPECIAL INTERNAL SURFACE PREPARATION (SHOT BLASTING OF PNEUMATIC COVEYING PIPING) IS ONLY REQUIRED FOR DILUTE PHASE PELLET (NOT GRANULAR) CONVEYING.

628 VALVES, GASKETS & COUPLINGS SHALL BE IN ACCORDANCE WITH THE RESPECTIVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 7C50.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

998 FOR PREFERRED AND MINIMUM ACCEPTABLE BEND RADIUS, LICENSOR SPECIFICATION 7C50 SHALL BE REFERRED.

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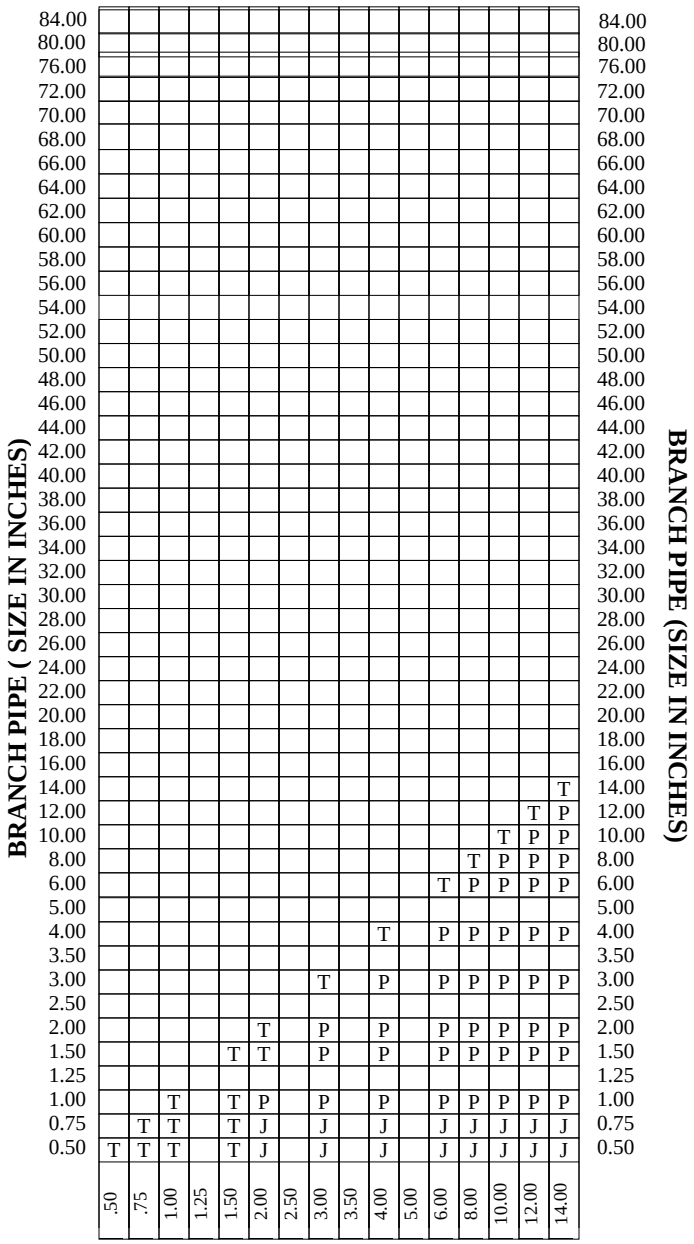
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A27K** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" SCRD BALL VALVE; REFER EIL STD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" SCRD BALL VALVE; REFER EIL STD 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" SCRD BALL VALVE; REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	ASPER P&ID OR WITH SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A27K** Sheet 3 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A27K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A27K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	1	2	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	10	14	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
NIP/	NIPPLE	.5	.75	40S	B-36.19	ASTM A312 GR.TP304/304L	TBE, SEAMLESS	PN3O7E7Z0	
Flange Group									
FLG	FLNG.LJ	1	14		B-16.5	ASTM A 182 GR.F316/316L	150, RF/125AARH	FLCD927Z0	
FLB	FLNG.BLIND	1	14		B-16.5	ASTM A 182 GR.F316/316L	150, RF/125AARH	FBCD927Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316/316L	150, FF/125AARH	FGKD921Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F316/316L	150, FF/125AARH	FCKD921Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A182 GR.F304/304L	SCRF, 3000	WA6U682Z0	351
ELB90	ELBOW.90	1	14	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	351
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A182 GR.F304/304L	SCRF, 3000	WB6U682Z0	351
ELB45	ELBOW.45	1	14	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	351
BND	PIPE.BEND	1	8	M	ASME B31.3	ASTM A403 GR.WP304/304L-S	BW, 12D	WCIU74FZ0	998
BND	PIPE.BEND	10	10	M	ASME B31.3	ASTM A403 GR.WP304/304L-S	BW, 10D	WCIU74EZ0	998
BND	PIPE.BEND	12	12	M	ASME B31.3	ASTM A403 GR.WP304/304L-S	BW, 8D	WCIU747Z0	998
BND	PIPE.BEND	14	14	M	ASME B31.3	ASTM A403 GR.WP304/304L-S	BW, 7D	WCIU74DZ0	998
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A182 GR.F304/304L	SCRF, 3000	WE6U682Z0	
TEQ	T.EQUAL	1	14	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A182 GR.F304/304L	SCRF, 3000	WR6U682Z0	
TRED	T.RED	1	14	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
REDC	REDUC.CONC	1	14	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDE	REDUC.ECC	1	14	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	

Package : IPMCS
Report No. : 50

A27K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A27K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	1	14	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.5	.75		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	
STB	STUB.END	1	14	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, STOCK	WSGU745Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YESU64ZZ0	
TLT	THREADOLET	.5	.75		MSS-SP97	ASTM A182 GR.F304/304L	SCRF, 3000	YTSU682Z0	312
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YLSU64ZZ0	311
Valves Group									
BLV	VLV.BALL	1	4		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M,BALL + STEM- SS316; SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543LN	543LNZZZ0	628
BLV/1	VLV.BALL	.5	.75		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M,BALL + STEM- SS316; SEAT- RPTFE	SCRF, 800, 3000, B-1.20.1, SHT NO.- 540LN	540LNZZZ0	312,628
MIS	VLV.MISC	2	14		MSS-SP81	BODY-ASTM A 351 GR.CF8M,TRIM-SS316 +HYCAR	WAF, 150, B-16.5, RF/125AARH, SHT NO.- 593LN	593LNZZZ0	353,628
Bolt Group									
BOS	BOLT.STUD	1	14		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	
Gasket Group									
GAS	GASKET	1	14		B-16.21-ANSI B16.5	WHITE NEOPRENE	FULLFACE, 150, 3 MM	GKBAF22Z0	628

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A28K** Sheet 1 of 5

PIPE CLASS : **A28K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	110	115
PRESS	19.3	19.3	15.6	15.5

SERVICE

RESIN CONVEYING / DILUTE PHASE / PELLETS (BASED ON LICENSOR PMS CLASS - LC52)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

351 ELBOWS ARE LIMITED TO USE IN VENT LINES AND AT THE TERMINATION OF CONVEYING LINES.

359 THIRTY (30) PIPE DIAMETERS SHOULDBE PROVIDED BET. SOLIDS INTRODUCTION POINT AND THE FIRST BEND. 20 PIPE DIA. (MIN.) SHOULD BE MAINTAINED BET. BENDS. (CONTD.)

360 ONLY VERTICAL & HORIZONTAL PIPE SHOULD BE USED; AVOID DIAGONAL SECTIONS. IF A DIAGONAL SECTION IS REQ., IT SHOULD NOT EXCEED 10 FEET IN LENGTH AND SHOULD NOT BE ANY STEEPER THAN 30 DEG. FROM HORIZONTAL.(CONTD.)

361 IDEALLY, REDUCERS INSTALLED IN THE PIPE SHOULD BE LOCATED IN A VERTICAL SECTION OF LINE AND PLACED AT LEAST 10 PIPE DIAMETERS FROM ANY BEND.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

723 END ENTRY; 316SS STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; 1 1/2; 3; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

752 THE BEND RADIUS MINIMUM TANGENT AND TOLERANCE SPECIFICATIONS SHALL BE IN ACCORDANCE WITH ENGINEERING DETAIL LSTD-2 'PNEUMATIC CONVEYING PIPE BEND DIMENSIONAL TOLERANCES' INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS VOLUME 2, SECTION 1X-2.

839 ASME B16.34/16.10 SHORT PATTERN

861 ALL FABRICATED PIPE REQUIRES INTERNAL TREATMENT. PIPE SHALL BE SHOT PEENED IN ACCORDANCE WITH PROJECT INSTRUCTIONS LSTD-1 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.

862 ALL PIPE & JOINTS, INCLUDING EQUIPMENT CONNECTIONS & ADJACENT GAS ONLY PIPING, SHALL BE ELECTRICALLY BONDED & GROUNDED. FLANGES & COUPLINGS MUST BE ELECTRICALLY BONDED WITH 4 AWG COPPER GROUNDING CONDUCTOR. GROUNDING IS REQUIRED EVERY 200 FT(61 M). WELD A TAB TO PIPING ON EACH SIDE OF FLANGED JOINT.

863 CARE SHALL BE EXERCISED DURING WELDING TO PROVIDE AS SMOOTH AS INTERIOR AS POSSIBLE. THE USE OF CONSUMABLE INSERTS IS RECOMMENDED.

868 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS.
EPDM; FOOD GRADE MATERIAL (FDA APPROVED); WHITE; THICKNESS: 1/8 INCH; MAXIMUM SHORE A HARDNESS 60; INSIDE DIAMETER (ID) OF GASKET TO MATCH STUB END ID.

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869 BEND RADIUS SHALL BE CONSIDERED IN SPECIFIED DIAMETERS AS PER P&ID AND PROCESS DESIGN PACKAGE, WHERE SCHEDULE 40S PIPE IS BUTT WELDED TO THINNER WALL PIPE OR FITTINGS,TAPER BORE THE ENDS OF THE SCHEDULE 40S TO MATCH THE ADJOINING THINNER WALL. THE APEX ANGLE OF THE TAPER BORE MUST NOT EXCEED 60 DEG.

871 ASME B16.34; CLASS 600; THREADED (NPTF); CAST; REDUCED PORT TYPE; 316 STAINLESS STEEL STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER; THREADED END PIECES SHALL BE SEAL WELDED TO BODY.

876 KNIFE GATE; RAISED FACE; TAPPED LUG; CAST; STAINLESS STEEL; WAFER STYLE; BOLTING: ASTM A 193 GR B7 W/ ASTM A 194 GR 2H FINISHED NUTS; GASKET: PTFE BODY SEAL; SEATING: PTFE; CHROME PLATED DISC; OPERATOR: HANDWHEEL; BOLT CIRCLE PER ASME B16.5 CLASS 150 DIMENSIONS; VALVE IS BI-DIRECTIONAL

888 PICKLED & PASSIVATED.

889 GALVANIZED AS PER ASTM A 123.

905 LICENSOR PMS LC52 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

913 LONG PATTERN

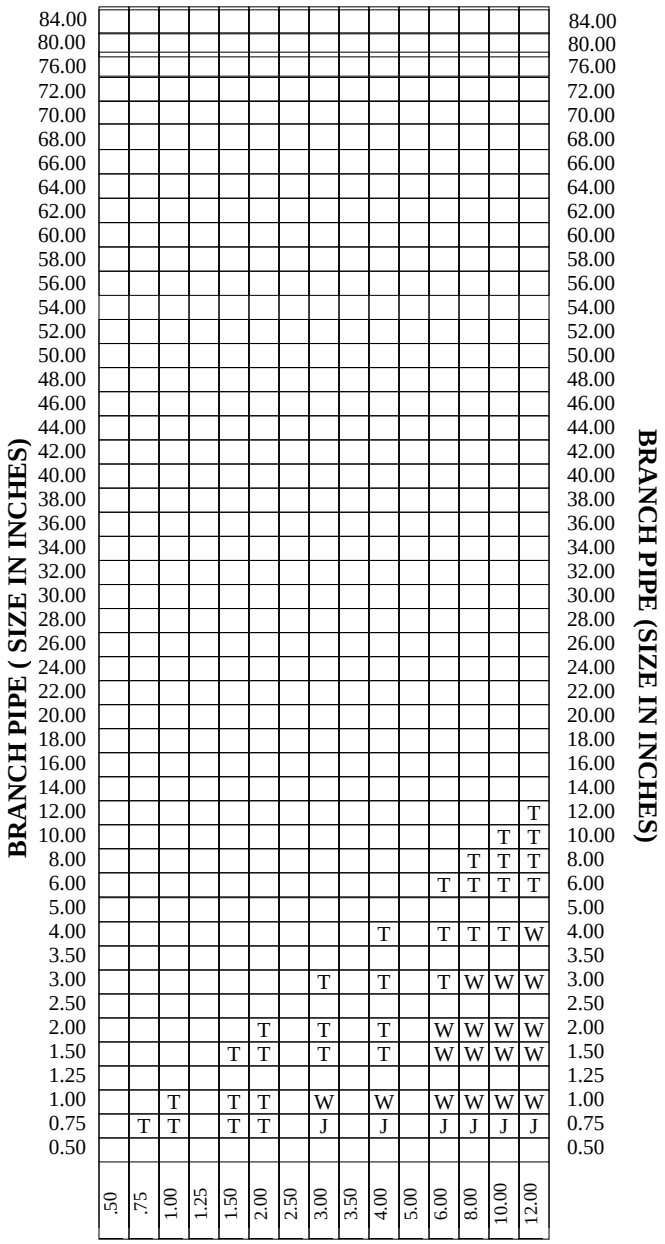
988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-905	
	ON LINES >= 2.0"	NOTE-905	
VENTS	ON LINES <= 1.5"	NOTE-905	
	ON LINES >= 2.0"	NOTE-905	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-905)	
PRESS.CONN	0.75"	NOTE-905	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A28K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A28K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	2	2	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	3	12	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
NIP/	NIPPLE	.75	.75	40S	B-36.19	ASTM A312 GR.TP304/304L	TBE, SEAMLESS	PN3O7E7Z0	
Flange Group									
FLG	FLNG.LJ	1	12		B-16.5	ASTM A 105(GALV.)	150, STK/MAX1000AARH	FLC072EZ0	889
FLB	FLNG.BLIND	1	12		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z0	
FEF	FLNG.FIG.8	1	8		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z0	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FCKD821Z0	
Fitting Group									
ELB90	ELBOW.90	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	351
ELB90	ELBOW.90	2	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	351
ELB45	ELBOW.45	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	351
ELB45	ELBOW.45	2	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	351
BND	PIPE.BEND	2	12	40S	ASME B31.3	ASTM A403 GR.WP304/304L-S	BW, 9D	WCIU748Z0	869,752
TEQ	T.EQUAL	1	1.5	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TEQ	T.EQUAL	2	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	1	1.5	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
TRED	T.RED	2	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
REDC	REDUC.CONC	1	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDE	REDUC.ECC	1	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
CAP	CAP	1	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
STB	STUB.END	1	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 125AARH	WSGU741Z0	913

Package : **IPMCS**
Report No. : **50**

A28K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A28K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
WLT	WELDOLET	1	10	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	
TLT	THREADOLET	.75	.75		MSS-SP97	ASTM A182 GR.F304/304L	SCRF, 3000	YTSU682Z0	
Valves Group									
BLV	VLV.BALL	.75	.75		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316 SEAT : RPTFE	SPCL, 600, 3000, B-1.20.1, REFER VMS SHT, SHT NO.- 545PQ	545PQZZZ0	871,720, 724,742
BLV	VLV.BALL	1	3		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543PQ	543PQZZZ0	723,720, 724,725, 742,839
MIS	VLV.MISC	2	12		MSS-SP81	BODY-ASTM A 351 GR.CF3M,DISC-CHROME PLATED,SEAT-PTFE	WAFL, 150, B-16.5, REFER VMS SHT, SHT NO.- 593PQ	593PQZZZ0	876,742
Bolt Group									
BOS	BOLT.STUD	1	12		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	1	12		B-16.21-ANSI B16.5	EPDM WHITE (SHORE A-60)	FULLFACE, 150, 3 MM	GKBEA22Z0	868

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A28M** Sheet 1 of 6

PIPE CLASS : **A28M**
RATING : 150
BASE MATERIAL : SS 316/316L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	-29	38	82	121	121
PRESS	10.5	-.6	10.5	10.5	-.6	3.9

SERVICE

RESIN CONVEYING GRAVITY FLOW (BASED ON LICENSOR PMS CLASS - LGP40)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

96 VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

359 THIRTY (30) PIPE DIAMETERS SHOULDBE PROVIDED BET. SOLIDS INTRODUCTION POINT AND THE FIRST BEND. 20 PIPE DIA. (MIN.) SHOULD BE MAINTAINED BET. BENDS. (CONTD.)

360 ONLY VERTICAL & HORIZONTAL PIPE SHOULD BE USED; AVOID DIAGONAL SECTIONS. IF A DIAGONAL SECTION IS REQ., IT SHOULD NOT EXCEED 10 FEET IN LENGTH AND SHOULD NOT BE ANY STEEPER THAN 30 DEG. FROM HORIZONTAL.(CONTD.)

361 IDEALLY, REDUCERS INSTALLED IN THE PIPE SHOULD BE LOCATED IN A VERTICAL SECTION OF LINE AND PLACED AT LEAST 10 PIPE DIAMETERS FROM ANY BEND.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

724 VALVE FIRE TESTED TO API 607

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

752 THE BEND RADIUS MINIMUM TANGENT AND TOLERANCE SPECIFICATIONS SHALL BE IN ACCORDANCE WITH ENGINEERING DETAIL LSTD-2 'PNEUMATIC CONVEYING PIPE BEND DIMENSIONAL TOLERANCES' INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS VOLUME 2, SECTION 1X-2.

779 THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS. VALVES ARE NOT VACUUM PREPARED OR SUITABLE BY DESIGN FOR CRITICAL VACUUM AND MAY ALLOW LEAKAGE INTO THE SYSTEM.

862 ALL PIPE & JOINTS, INCLUDING EQUIPMENT CONNECTIONS & ADJACENT GAS ONLY PIPING, SHALL BE ELECTRICALLY BONDED & GROUNDED. FLANGES & COUPLINGS MUST BE ELECTRICALLY BONDED WITH 4 AWG COPPER GROUNDING CONDUCTOR. GROUNDING IS REQUIRED EVERY 200 FT(61 M). WELD A TAB TO PIPING ON EACH SIDE OF FLANGED JOINT.

868 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS.
EPDM; FOOD GRADE MATERIAL (FDA APPROVED); WHITE; THICKNESS: 1/8 INCH; MAXIMUM SHORE A HARDNESS 60; INSIDE DIAMETER (ID) OF GASKET TO MATCH STUB END ID.

869 BEND RADIUS SHALL BE CONSIDERED IN SPECIFIED DIAMETERS AS PER P&ID AND PROCESS DESIGN PACKAGE, WHERE SCHEDULE 40S PIPE IS BUTT WELDED TO THINNER WALL PIPE OR FITTINGS,TAPER BORE THE ENDS OF THE SCHEDULE 40S TO MATCH THE ADJOINING THINNER WALL. THE APEX ANGLE OF THE TAPER BORE MUST NOT

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Client :BPCL	**Dept./Sect. :** 16/43
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EXCEED 60 DEG.

888 PICKLED & PASSIVATED.

899 ASME B16.34/16.10 LONG PATTERN; FULL PORT TYPE; BOLTING: ASTM A 193 GR B8; SS316 STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL.

914 SHORT PATTERN

916 LICENSOR PMS LGP40 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

917 TAPER BORING OF THE TANGENT ENDS OF MITER BENDS WILL BE NECESSARY IF SCHEDULE 40S OR THICKER, SEE NOTE-869 FOR TAPER BORING CRITERIA.

918 ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; FULL PORT TYPE; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED PTFE OR METAL OR PTFE WITH METAL; API TRIM #10; DISC: SOLID WEDGE; PACKING: PTFE; PACKING TYPE: CHEVRON; OPERATOR: HANDWHEEL.

919 FOR USAGE OF VALVES IN AREAS SUBJECTED TO CHLORIDE STRESS CRACKING CONSIDERATIONS, REQUIREMENTS SPECIFIED IN THE LICENSOR SPECIFICATION LGP40 SHALL BE CONSIDERED.

920 KNIFE GATE; TAPPED LUG OR DOUBLE FLG; CAST; WAFER STYLE; BONNETLESS; BOLTING: ASTM A 193 GR B8; SEATING: METAL; SS316 TRIM; ROUND PORT; PACKING: PTFE; BOLTED PACKING GLAND; OPERATOR: HANDWHEEL; BOLT CIRCLE PER ASME B16.5 CLASS 150 DIMENSIONS; VALVE IS UNIDIRECTIONAL.

921 USE MANUFACTURER RECOMMENDED BOLT LENGTHS IN THE CHEST AREA. THE PHRASE "TAPPED LUG OR DOUBLE FLANGE" REMAINS IN THE DESCRIPTION TO COVER THE INSTALL BASE AND VALVE RECONDITIONING.

922 VALVE; BUTTERFLY; TAPPED LUG; DUCTILE IRON; ASTM A 395; STAINLESS STEEL STEM; SEATING: EPDM; STAINLESS STEEL DISC; OPERATOR: THROTTLING LOCKING LEVER.

923 VALVE; BUTTERFLY; TAPPED LUG; DUCTILE IRON; ASTM A 395; STAINLESS STEEL STEM; SEATING: EPDM; STAINLESS STEEL DISC; OPERATOR: WEATHERPROOF GEAR.
NOTE: 8-THREAD SERIES BOLTS ARE REQUIRED WHEN THE FLANGE BOLT DIAMETER IS 1 1/8 INCH OR LARGER PER ASTM A 193.

924 BUTT WELDING X NPTF; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; API TRIM #10; DISC: SOLID WEDGE; PACKING: PTFE; PACKING TYPE: CHEVRON; OPERATOR: HANDWHEEL.

958 TAPPED LUG

984 FOR DISC BLIND ASSEMBLY DETAILS, REFER LSTD-4 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2) ALONG WITH LICENSOR SPECIFICATION LGP40.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

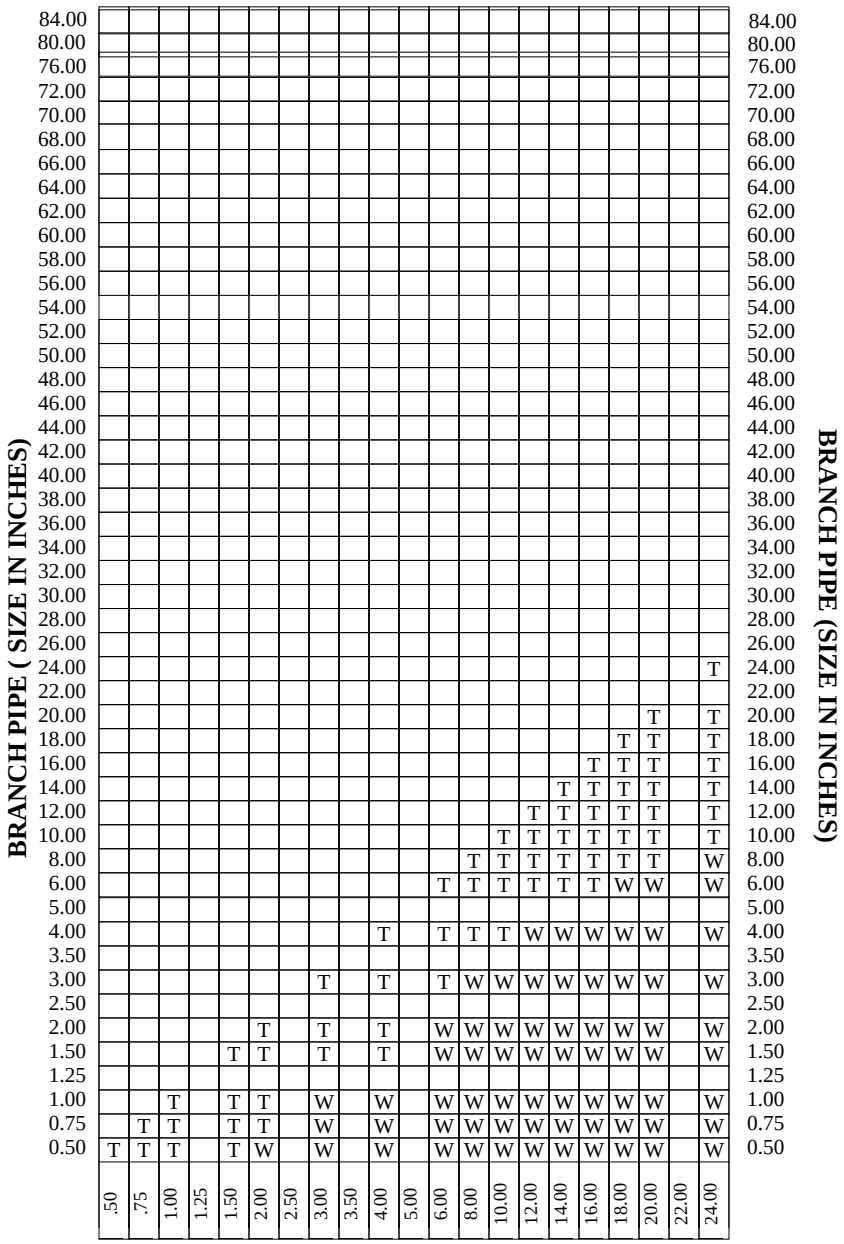
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-916	
	ON LINES >= 2.0"	NOTE-916	
VENTS	ON LINES <= 1.5"	NOTE-916	
	ON LINES >= 2.0"	NOTE-916	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-916)	
PRESS.CONN	0.75"	NOTE-916	

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Report No. : 50

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A28M

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	2	8	10S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	10	24	10S	B-36.19	ASTM A358 TP316/316L CL.1 DUAL	BE, E.FS.W	PI3R113Z0	888
Flange Group									
FLG	FLNG.WN	.5	1.5	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	150, RF/125AARH	FWCF727Z0	
FLG/150	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	150, RF/125AARH	FWCF727Z0	710
FLG	FLNG.LJ	2	24		B-16.5	ASTM A 105	150, STK/MAX1000AARH	FLC012EZ0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F316/316L DUAL	150, RF/125AARH	FBCF727Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	150, FF/125AARH	FGKF721Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	150, FF/125AARH	FCKF721Z0	
Fitting Group									
BND	PIPE.BEND	.5	8	M	ASME B31.3	ASTM A403 GR.WP316/316L-S DUAL	BW, XD	WCIX24AZ0	752,869
BND	PIPE.BEND	10	16	M	ASME B31.3	ASTM A403GR.WP316/316L-WX DUAL	BW, XD	WCIX34AZ0	752,869
TEQ	T.EQUAL	.5	1.5	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WEGX24ZZ0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WEGX24ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A403GR.WP316/316L-WX DUAL	BW	WEGX34ZZ0	
TRED	T.RED	.5	1.5	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WRGX24ZZ0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S	BW	WRGX24ZZ0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
						DUAL			
TRED	T.RED	10	24	M, M	B-16.9	ASTM A403GR.WP316/316 L-WX DUAL	BW	WRGX34ZZ0	
REDC	REDUC.CONC	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WUGX24ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A403GR.WP316/316 L-WX DUAL	BW	WUGX34ZZ0	
REDE	REDUC.ECC	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WVGX24ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A403GR.WP316/316 L-WX DUAL	BW	WVGX34ZZ0	
CAP	CAP	.5	24	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WFGX24ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F316/316L DUAL	SCRM, 3000	WH6X192Z0	307
STB	STUB.END	2	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 125AARH	WSGX241Z0	914
STB	STUB.END	10	24	M	B-16.9	ASTM A403GR.WP316/316 L-WX DUAL	BW, 125AARH	WSGX341Z0	914
O'let Group									
WLT	WELDOLET	.5	12	M, M	MSS-SP97	ASTM A182 GR.F316/316L DUAL	BW	YWSX14ZZ0	
Valves Group									
GAV	VLV.GATE	.5	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513QL	513QLZZZ0	918,742, 743,919
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510QL	510QLZZZ0	924,728, 742
BLV	VLV.BALL	.5	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543QL	543QLZZZ0	899,720, 724,742, 743,919
BFV	VLV.BTRFLY	2	3		BS EN 593	BODY-ASTM A 395,STEM & DISC-STAINLESS STEEL,SEAT-EPDM	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 563RE	563REZZZ0	922,742, 958

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Location BINA, MADHYA PRADESH	**Pipe Class :A28M** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BFV	VLV.BTRFLY	4	24		BS EN 593	BODY-ASTM A 395,STEM & DISC-STAINLESS STEEL,SEAT-EPDM	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 563RE	563REZZZ0	923,742, 958
MIS	VLV.MISC	2	24		MSS-SP81	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, REFER VMS SHT, SHT NO.- 593QL	593QLZZZ0	920,742, 743,919, 921
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	EPDM WHITE (SHORE A-60)	FULLFACE, 150, 3 MM	GKBEA22Z0	868

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Location BINA, MADHYA PRADESH	**Pipe Class :A2A** Sheet 1 of 6

PIPE CLASS : **A2A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	280	300	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	11.19	10.44	7.73

SERVICE

STEAM (IBR), BOILER FEED WATER (IBR) & CONDENSATE (IBR)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

9 CARBON CONTENT SHALL NOT EXCEED 0.25% FOR ALL PIPES,FITTINGS FLANGES ETC. THAT MAY REQUIRE WELDING. MOREOVER,FOR FLANGES THE SULPHUR AND PHOSPHOROUS SHALL ALSO BE LIMITED TO 0.05% EACH.

92 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH B-16.34 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.

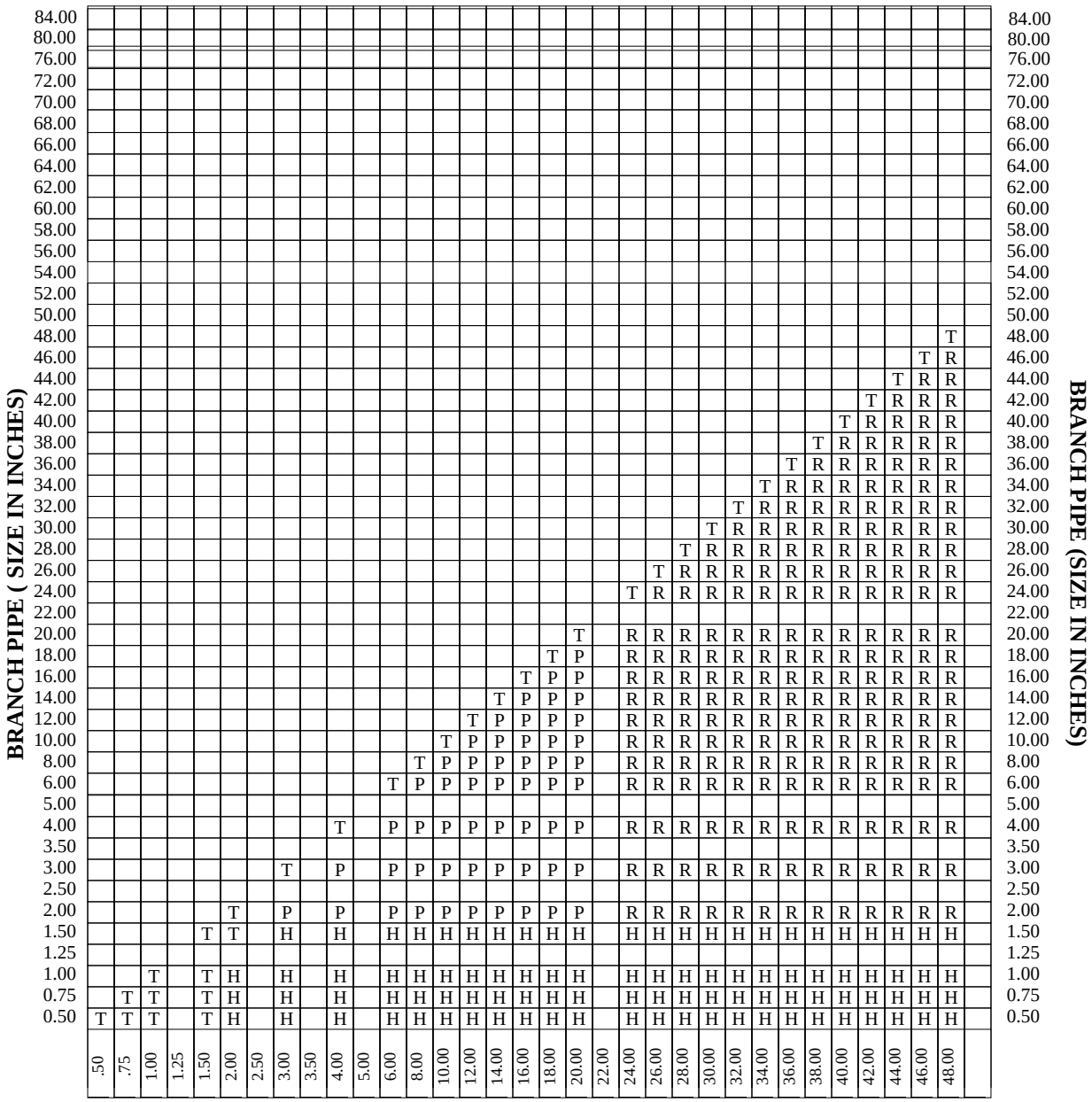
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
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A2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A2A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	16	36	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	
PIP	PIPE	38	48	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z1	
FLG	FLNG.WN	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z1	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z1	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z1	
FLG/300	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z1	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z1	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z1	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z1	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z1	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z1	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z1	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z1	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z11	

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Location BINA, MADHYA PRADESH	**Pipe Class :A2A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z11	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z1	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z1	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z11	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z11	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z1	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z1	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ1	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ1	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z1	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z1	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ1	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ1	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ1	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ1	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ1	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ1	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ1	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z1	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z1	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A2A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z1	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z1	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z1	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z1	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51002	51002ZZZ1	
GAV	VLV.GATE	2	36		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51302	51302ZZZ1	92
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52002	52002ZZZ1	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52302	52302ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53002	53002ZZZ1	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53302	53302ZZZ1	
BLV	VLV.BALL	.5	1.5		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-PEEK	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54302	54302ZZZ1	
G3V	VLV.PISTON	.5	1		MNF'STD	BODY-ASTM A 105,TRIM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 64002	64002ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	

Package : IPMCS
Report No. : 50

A2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A2A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS/300	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 150,RF/125AARH	TR3065531	
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z1	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D511	
PSR	STRNR.PERM	2	24		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 150,RF/125AARH	SP3805531	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A32A** Sheet 1 of 4

PIPE CLASS : **A32A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	280
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	11.19

SERVICE

NONIBR STEAM TRACING (BEYOND STEAM SUPPLY MANIFOLD ISOLATION VALVES),NONIBR TRACER CONDENSATE. IN CASE PRES-INSULATED TUBING IS TO BE USED, THIS SPEC SHALL BE USED ONLY FOR TRACING ALONG CS TRACED PIPING.

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0"	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >=2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, VF3	
	ON LINES >=2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN.	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN.	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A32A** Sheet 2 of 4

BRANCH PIPE (SIZE IN INCHES)

BRANCH	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	BRANCH
84.00									84.00
80.00									80.00
76.00									76.00
72.00									72.00
70.00									70.00
68.00									68.00
66.00									66.00
64.00									64.00
62.00									62.00
60.00									60.00
58.00									58.00
56.00									56.00
54.00									54.00
52.00									52.00
50.00									50.00
48.00									48.00
46.00									46.00
44.00									44.00
42.00									42.00
40.00									40.00
38.00									38.00
36.00									36.00
34.00									34.00
32.00									32.00
30.00									30.00
28.00									28.00
26.00									26.00
24.00									24.00
22.00									22.00
20.00									20.00
18.00									18.00
16.00									16.00
14.00									14.00
12.00									12.00
10.00									10.00
8.00									8.00
6.00									6.00
5.00									5.00
4.00									4.00
3.50									3.50
3.00								T	3.00
2.50									2.50
2.00						T		P	2.00
1.50					T	T		H	1.50
1.25									1.25
1.00			T		T	H		H	1.00
0.75		T	T		T	H		H	0.75
0.50	T	T	T		T	H		H	0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A32A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A32A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.WN	2	3	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A32A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	42		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	51301ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	53301ZZZ0	
BLV	VLV.BALL	.5	3		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-PEEK	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54322	54322ZZZ0	
G3V	VLV.PISTON	.5	1		MNF'STD	BODY-ASTM A 105,TRIM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 64022	64022ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	3		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, BPTHRMST, 150,RF/125AARH	TR3065730	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A34M** Sheet 1 of 3

PIPE CLASS : **A34M**
RATING : 150
BASE MATERIAL : SS 316
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	121
PRESS	175.7	175.7	126.5

SERVICE

CHEMICALS (BASED ON LICENSOR PMS CLASS - 6G71)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

301 IF BEND TUBING IS USED FOR ELBOWS, ALL BENDS TO BE MADE WITH STANDARD TUBING BENDERS USING GOOD WORKMANSHIP. FLATTENED, KINKED OR WRINKLED BENDS ARE NOT ACCEPTABLE.

303 FITTINGS (TEES, ELBOWS, ADAPTORS, COUPLINGS) SHALL BE FLARELESS FERRULE TYPE TUBE FITTINGS (SWAGELOCK OR APPROVED EQUAL). FOR CONNECTIONS TO PIPE (NPT) AT PROCESS, USE STANDARD STAINLESS STEEL ADAPTERS. FITTINGS MATRIAL SHALL BE TYPE 316 SS DMN STD REF TO MNF STD.

306 USE NUPRO C OR CP SERIES VALVES.

365 USE WHITEY 3 PIECE BODY VALVE

366 USE WHITEY "33" SERIES LOW TEMPERATURE MODEL OR EQUAL.

368 PRESSURE TEMPEATURE LIMITATION OF THIS PIPING CLASSIFICATIONSHALL BEAS FOLLOWS:- FOR SIZE 1/8"-3/8": AT TEMP. -45 DEGC- PRESS 175.7 KG/CM2, AT TEMP. 38 DEG C- PRESS 175.7 KG/CM2, AT TEMP 121 DEG.C- PRESS 126.5 KG/CM2.

370 PRESSURE TEMPEATURE LIMITATION OF THIS PIPING CLASSIFICATION SHALL BE AS FOLLOWS:- FOR SIZE 1/2"-1": AT TEMP. -45 DEGC- PRESS 70.30 KG/CM2, AT TEMP. 38 DEG C- PRESS 70.30 KG/CM2, AT TEMP 121 DEG.C- PRESS 70.30 KG/CM2

625 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 6G71

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

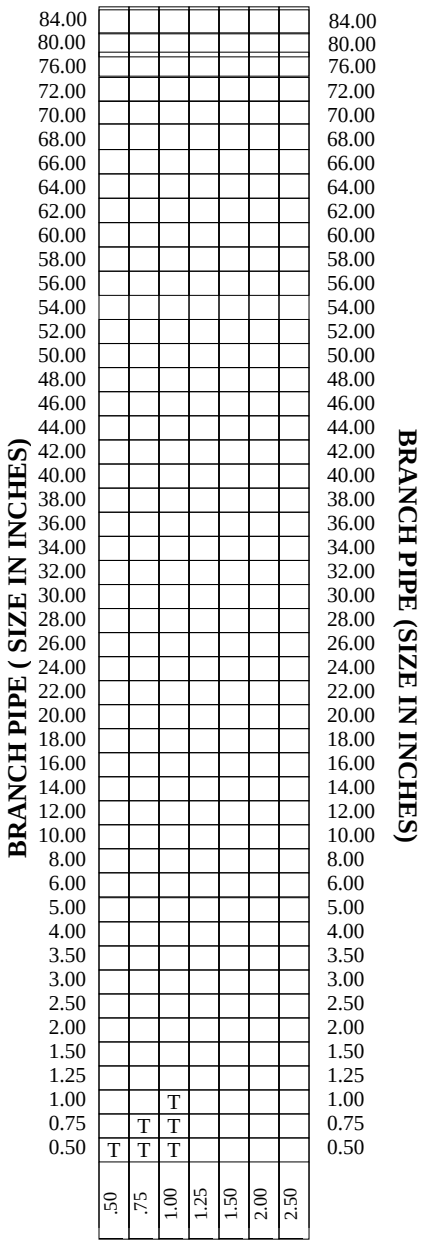
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A34M** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A34M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A34M** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
TUB	TUBE	.125	.625	0.89	MNF'STD	ASTM A 269 TP316	PE, SEAMLESS	PT93377Z0	
TUB	TUBE	.75	1	1.65	MNF'STD	ASTM A 269 TP316	PE, SEAMLESS	PT93377Z0	
Valves Group									
GAV	VLV.GATE	.5	1		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SCRF, 800, 3000, B-1.20.1, SHT NO.-510MM	510MMZZZ0	625
GLV	VLV.GLOBE	.25	1		BS EN ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SCRF, 800, 3000, B-1.20.1, SHT NO.-520MM	520MMZZZ0	625
CHV	VLV.CHECK	.25	1		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-ETHYLENE PROPYLENE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-532MM	532MMZZZ0	625
BLV	VLV.BALL	.25	.375		MNF'STD	BODY-ASTM A 351 GR.CF8M,BALL+STEM-SS316;SEAT-PTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542MM	542MMZZZ0	625
BLV/2	VLV.BALL	.5	1		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+STEM-SS316;SEAT-RPTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542NL	542NLZZZ0	625

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35L** Sheet 1 of 3

PIPE CLASS : **A35L**
RATING : 150
BASE MATERIAL : MISCELLANEOUS
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP
PRESS

SERVICE

AIR: BIN PURGE, CONVEYING AIR SUPPLY (BASED ON LICENSOR PMS CLASS - 4C3)

NOTES

640 FOR THIS SPEC REFER LICENSOR CLASS 4C3

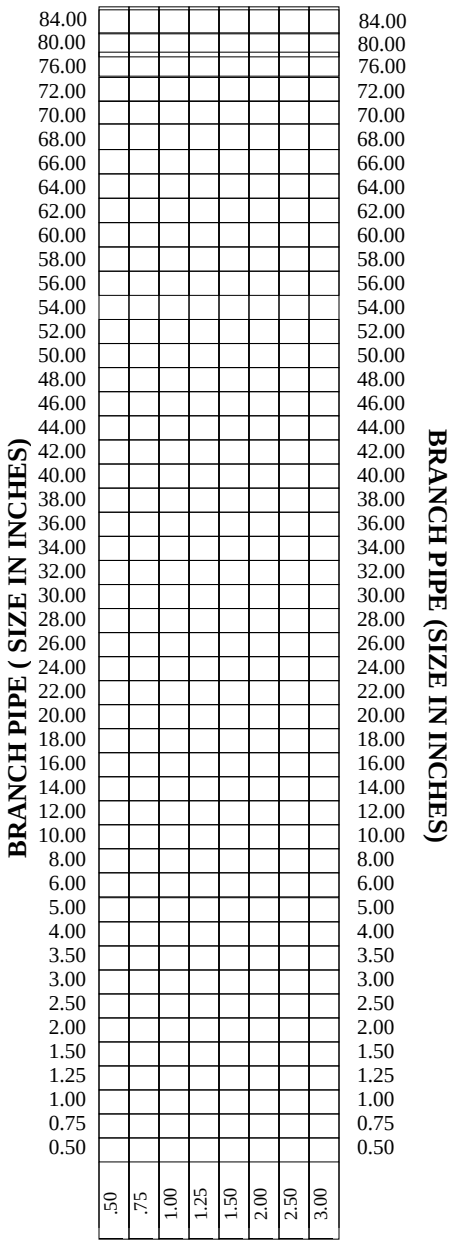
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35L** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A35L

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35L** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35M** Sheet 1 of 3

PIPE CLASS : **A35M**
RATING : 150
BASE MATERIAL : SS 316
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-46	-29	107
PRESS	175.7	196.8	196.8

SERVICE

ADDITIVES (BASED ON LICENSOR PMS CLASS - 6G73)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

301 IF BEND TUBING IS USED FOR ELBOWS, ALL BENDS TO BE MADE WITH STANDARD TUBING BENDERS USING GOOD WORKMANSHIP. FLATTENED, KINKED OR WRINKLED BENDS ARE NOT ACCEPTABLE.

302 ONLY DEPEND UPON P&ID NOTE.

303 FITTINGS (TEES, ELBOWS, ADAPTORS, COUPLINGS) SHALL BE FLARELESS FERRULE TYPE TUBE FITTINGS (SWAGELOCK OR APPROVED EQUAL). FOR CONNECTIONS TO PIPE (NPT) AT PROCESS, USE STANDARD STAINLESS STEEL ADAPTERS. FITTINGS MATRIAL SHALL BE TYPE 316 SS DMN STD REF TO MNF STD.

304 USE "WHITEY UNION BONNET" VALVES "NB SERIES" OR EQUAL.

305 USE ONLY WHERE STRAIGHT-THROUGH BALL VALVE IS REQUIRED. PREFFERED SHUTOFF VALVE IS GL5013.

306 USE NUPRO C OR CP SERIES VALVES.

393 PRESSURE TEMPERATURE LIMITATION OF THIS PIPING CLASSIFICATION SHALL BE AS FOLLOWS:- FOR SIZE 1/8"-1/2": AT TEMP -29 DEG.C- PRESS. 196.8 KG/CM2, AT TEMP 107 DEG C-PRESS. 196.8 KG/CM2

394 PRESSURE TEMPERATURE LIMITATION OF THIS PIPING CLASSIFICATION SHALL BE AS FOLLOWS:- FOR SIZE 5/8"-3/4": AT TEMP -29 DEG.C- PRESS. 105.4 KG/CM2, AT TEMP 107 DEG C-PRESS. 105.4 KG/CM2

398 ALL HYDROGEN SERVICE WELDS SHALL BE FULL PENETRATION WITH SMOOTH WELD PROFILE.

399 ALL MATERIALS SHALL BE FURNISHED IN THE SOLUTION HEAT TREATED CONDITION.

626 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 6G73

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

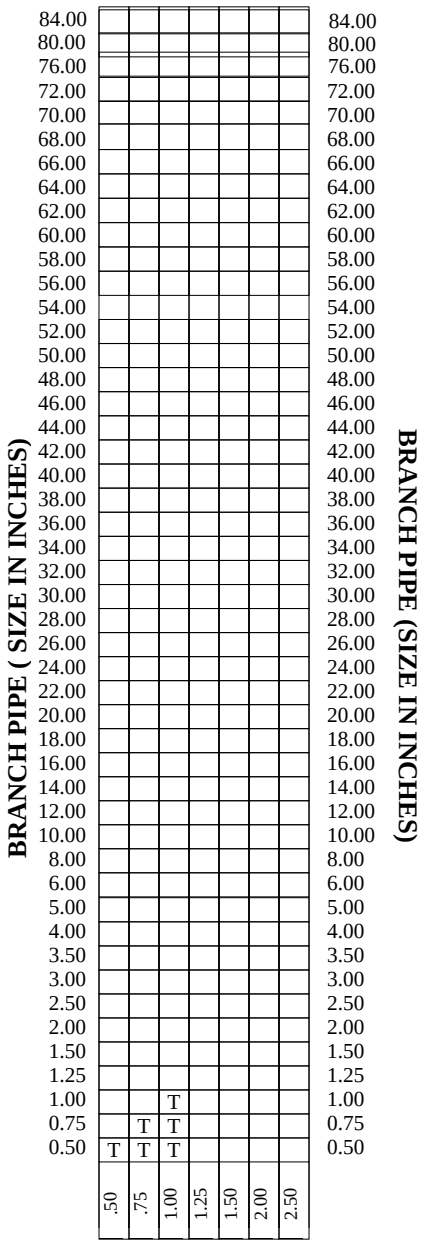
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35M** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A35M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A35M** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
TUB	TUBE	.125	.125	0.71	MNF'STD	ASTM A 269 TP316	PE, SEAMLESS	PT93377Z0	
TUB	TUBE	.25	.375	0.89	B-36.19	ASTM A 269 TP316	PE, SEAMLESS	PT33377Z0	
TUB	TUBE	.5	.5	1.25	MNF'STD	ASTM A 269 TP316	PE, SEAMLESS	PT93377Z0	
TUB	TUBE	.625	.75	1.65	MNF'STD	ASTM A 269 TP316	PE, SEAMLESS	PT93377Z0	
Valves Group									
GLV	VLV.GLOBE	.25	.75		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS316;SEATS-STELLITED	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.-522MN	522MNZZZ0	626
CHV	VLV.CHECK	.25	.75		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS 316;DISK SEAT-SS316+VITON	SPCL, 6000, 9000, MNF'STD, REFER VMS SHT, SHT NO.-532MN	532MNZZZ0	626
BLV	VLV.BALL	.25	.75		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+SEAT-SS316+CARBON-PTFE	SPCL, 6000, 9000, MNF'STD, REFER VMS SHT, SHT NO.-542MN	542MNZZZ0	626
BLV/4	VLV.BALL	.5	.5		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+STEM-SS316;SEAT-PCTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542VQ	542VQZZZ0	626
BLV/3	VLV.BALL	.75	.75		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,BALL+STEM-SS316;SEAT-NYLON	SPCL, 1500, 3000, B-16.11, REFER VMS SHT, SHT NO.- 542VP	542VPZZZ0	626
NDV	VLV.NEEDLE	.25	.75		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS316; SEAT-PTFE	SPCL, 6000, 9000, MNF'STD, REFER VMS SHT, SHT NO.-582MN	582MNZZZ0	626

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A36L** Sheet 1 of 3

PIPE CLASS : **A36L**
RATING : 150
BASE MATERIAL : MISCELLANEOUS
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP
PRESS

SERVICE

RESIN CONVEYING (BASED ON LICENSOR PMS CLASS - 4C4)

NOTES

641 FOR THIS SPEC REFER LICENSOR CLASS 4C4

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

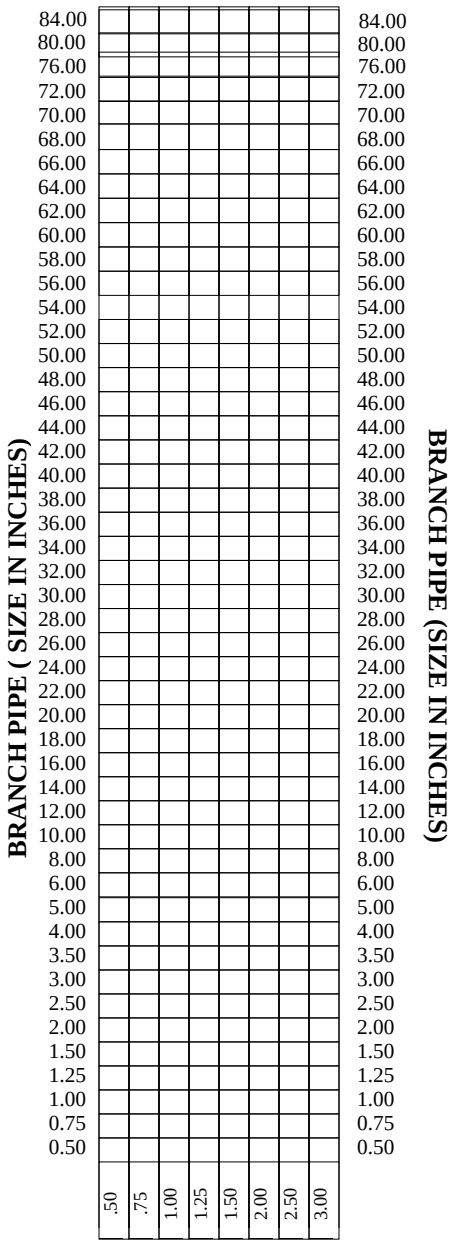
SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A36L** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A36L

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A36L** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37K** Sheet 1 of 3

PIPE CLASS : **A37K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-46	260	400
PRESS	175.76	175.76	10.54

SERVICE

ALL PURPOSE (BASED ON LICENSOR PMS CLASS - 6G69)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

301 IF BEND TUBING IS USED FOR ELBOWS, ALL BENDS TO BE MADE WITH STANDARD TUBING BENDERS USING GOOD WORKMANSHIP. FLATTENED, KINKED OR WRINKLED BENDS ARE NOT ACCEPTABLE.

302 ONLY DEPEND UPON P&ID NOTE.

303 FITTINGS (TEES, ELBOWS, ADAPTORS, COUPLINGS) SHALL BE FLARELESS FERRULE TYPE TUBE FITTINGS (SWAGELOCK OR APPROVED EQUAL). FOR CONNECTIONS TO PIPE (NPT) AT PROCESS, USE STANDARD STAINLESS STEEL ADAPTERS. FITTINGS MATRIAL SHALL BE TYPE 316 SS DMN STD REF TO MNF STD.

306 USE NUPRO C OR CP SERIES VALVES.

365 USE WHITEY 3 PIECE BODY VALVE

366 USE WHITEY "33" SERIES LOW TEMPERATURE MODEL OR EQUAL.

368 PRESSURE TEMPEATURE LIMITATION OF THIS PIPING CLASSIFICATIONSHALL BE AS FOLLOWS:- FOR SIZE 1/8"-3/8": AT TEMP. -46 DEGC- PRESS 175.76 KG/CM2, AT TEMP. 260 DEG C- PRESS 175.76 KG/CM2, AT TEMP 400 DEG.C- PRESS 10.54 KG/CM2.

369 PRESSURE TEMPEATURE LIMITATION OF THIS PIPING CLASSIFICATION SHALL BE AS FOLLOWS:- FOR SIZE 1/2"-1": AT TEMP. -46 DEGC- PRESS 77.33 KG/CM2, AT TEMP. 260 DEG C- PRESS 77.33 KG/CM2, AT TEMP 400 DEG.C- PRESS 10.54 KG/CM2.

624 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 6G69

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

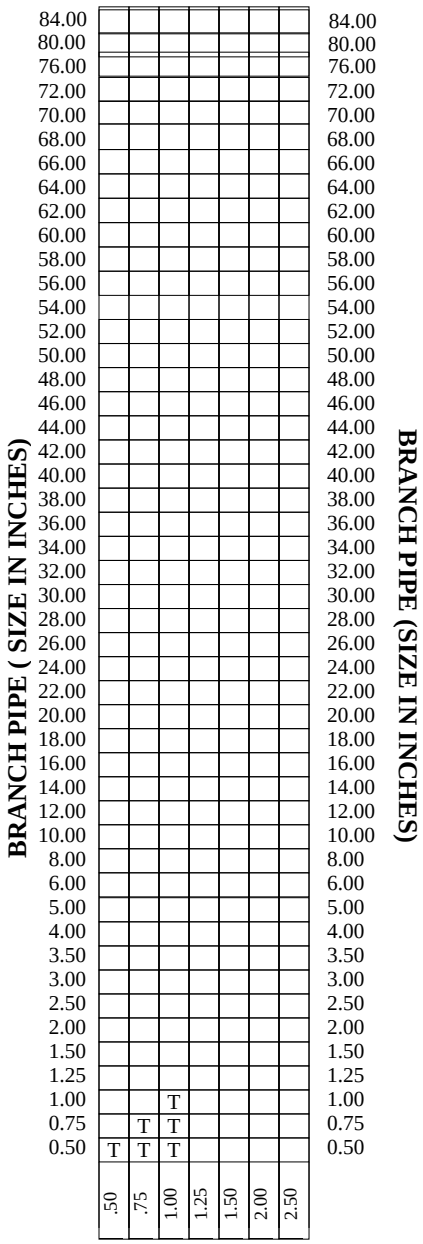
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37K** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A37K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37K** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
TUB	TUBE	.125	.125	0.71	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	.25	.25	0.89	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	.375	.375	1.25	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	.5	.625	0.89	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	.75	.75	1.65	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	1	1	1.65	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
TUB	TUBE	1	1	2.1	MNF'STD	ASTM A 269 TP304	PE, SEAMLESS	PT93177Z0	
Valves Group									
GLV	VLV.GLOBE	.125	1		BS EN ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-SS 316	SCRF, 800, 3000, MNF'STD, SHT NO.-522ML	522MLZZZ0	624
CHV	VLV.CHECK	.125	1		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS316+VITON	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-532ML	532MLZZZ0	624
CHV/3	VLV.CHECK	.5	.5		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS 316	SCRF, 6000, 3000, MNF'STD, SHT NO.-532NM	532NMZZZ0	624
CHV/1	VLV.CHECK	.5	.5		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS316	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-532NN	532NNZZZ0	624
BLV	VLV.BALL	.125	.75		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+SEAT-SS316+RPTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542ML	542MLZZZ0	624
BLV/4	VLV.BALL	.125	1		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+SEAT-SS316+RPTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542WM	542WMZZZ0	624
BLV/3	VLV.BALL	.5	.5		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+SEAT-SS316+RPTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542NM	542NMZZZ0	624
BLV/2	VLV.BALL	.125	.75		MNF'STD	BODY-ASTM A 182 GR.F316,BALL+SEAT-SS316+PTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-542NN	542NNZZZ0	624
NDV	VLV.NEEDLE	.125	.75		MNF'STD	BODY-ASTM A 182 GR.F316,TRIM-SS316;SEAT-PTFE	SPCL, 6000, 3000, MNF'STD, REFER VMS SHT, SHT NO.-582ML	582MLZZZ0	624

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37L** Sheet 1 of 3

PIPE CLASS : **A37L**
RATING : 150
BASE MATERIAL : MISCELLANEOUS
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP
PRESS

SERVICE

RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - 4C8)

NOTES

642 FOR THIS SPEC REFER LICENSOR CLASS 4C8

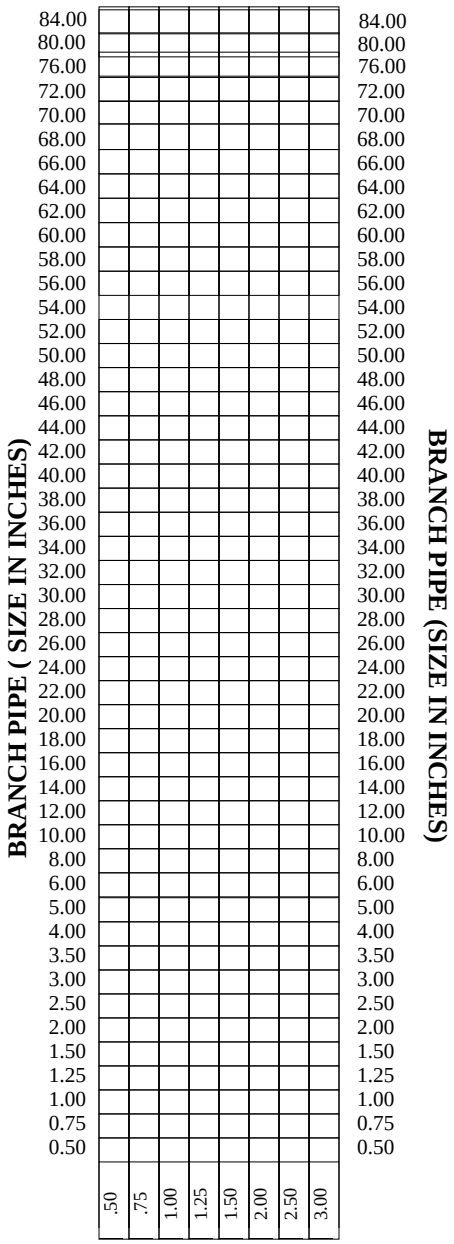
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37L** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A37L

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A37L** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 1 of 9

PIPE CLASS : **A3A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65	100	150	186
PRESS	10.55	10.55	10.55	10.55	10.55	10.55	10.55

SERVICE

NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DIOXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR), CRWS/ SS/ VENT (A/G). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE.

NOTES

4 USAGE OF UNIONS TO BE RESTRICTED TO WATER SERVICES ONLY.

6 FOR FABRICATED REDUCERS,REFER EIL'STD 7-44-0485 & 7-44-0487. FOR MITRES, REFER EIL'STD 7-44-0033.

31 USE BUTTERFLY VALVES INSTEAD OF GATE VALVES FROM 10" ONWARDS IN WATER SERVICE AND UPTO 70 DEG C. DESIGN PRESSURE FOR BUTTERFLY VALVES IS LIMITED UPTO 10 BAR.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

76 FOR PERMANENT BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300.

77 FOR SIZES > 24", SPACER & BLIND SHALL BE AS PER EIL'STD 7-44-0164.

86 BUTTERFLY VALVES FOR THE SPEC ARE PN10 RATED WITH A MAXIMUM PRESSURE OF 10.2 KG/CM2G.

99 BLIND FLANGES AND SPACER & BLINDS SPECIFIED TO MANUFACTURER'S STANDARD SHALL BE DESIGNED FOR 70 DEG.C AND 7.0 KG/CM2G TO SUIT 150#, FF, 125AARH, AWWA C207 CL.D FLANGES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

155 GASKET SHALL CONFIRM TO ALL THE TESTING REQUIREMENTS OF BS 7531 AND THICKNESS TOLERANCES SHALL BE AS PER TOLERANCES FOR 2 MM THICKNESS SPECIFIED IN BS 7531 .

993 FOR LICENSOR SPECIFICATIONS 1C13 IN UNIVATION, FOR SIZE RANGE 0.5" TO 0.75": STR-361, FOR 1" TO 1.5"-STR-366 & FOR 2" TO 12" : STR-351 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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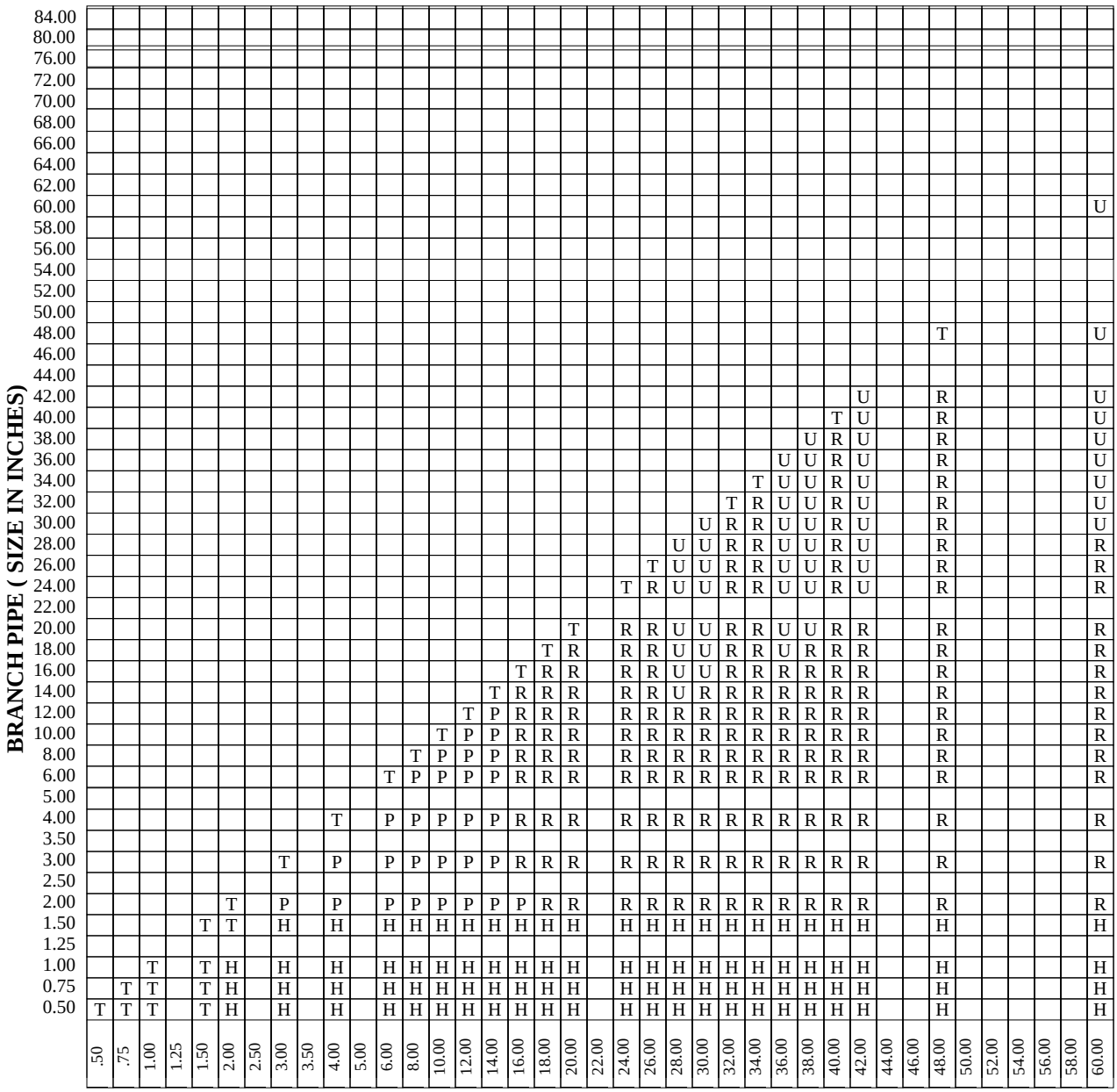
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 2 of 9

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-350, DF3	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD. 7-44-351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VC1	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD 7-44-351, V1	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-353	
PRESS.CONN	0.75"	SW, SH HVY NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 3 of 9



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A3A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 4 of 9

BRANCH PIPE (SIZE IN INCHES)

84.00
80.00
76.00
72.00
70.00
68.00
66.00
64.00
62.00
60.00
58.00
56.00
54.00
52.00
50.00
48.00
46.00
44.00
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
5.00
4.00
3.50
3.00
2.50
2.00
1.50
1.25
1.00
0.75
0.50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 5 of 9

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	22	6.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	24	30	8.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	32	38	10.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	40	42	12.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	48	48	14.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	60	60	CALC	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	62	62	CALC	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	78	78	CALC	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	96	96	CALC	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.SO	2	24		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLG	FLNG.SO	26	42		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLG	FLNG.SO	48	48		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLG	FLNG.SO	60	60		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	42		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	
FLB	FLNG.BLIND	48	48		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 6 of 9

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Flange Group									
FLB	FLNG.BLIND	60	60		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	42		AWWA C207D/EIL'STD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	
FEF	SPCR&BLND	48	48		AWWA C207D/EIL'STD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	
FEF	SPCR&BLND	60	60		AWWA C207D/EIL'STD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	42	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	48	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	42	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	48	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
MIT90	MITRE.90	60	60	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WDMF241Z0	
MIT90	MITRE.90	62	62	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WDMF241Z0	
MIT90	MITRE.90	78	78	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WDMF241Z0	
MIT90	MITRE.90	96	96	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WDMF241Z0	
MIT45	MITRE.45	60	60	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WGMF241Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 7 of 9

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
MIT45	MITRE.45	62	62	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WGMF241Z0	
MIT45	MITRE.45	78	78	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WGMF241Z0	
MIT45	MITRE.45	96	96	M	JOB'STD	IS-3589 GR.410	BW, 1.5D	WGMF241Z0	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	50	60	M, M	EIL'STD	IS-3589 GR.410	BW	WUKF24ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	50	60	M, M	EIL'STD	IS-3589 GR.410	BW	WVKF24ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	60	60	CALC	ASME-VIII	ASTM A 516 GR.70	BW	WF3BY4ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 8 of 9

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
UNN	UNION	.5	1.5		BS-3799	ASTM A 105	SW, 3000	WQH02D2Z0	4
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52321	52321ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
CHV	VLV.CHECK	26	48		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 53316	53316ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54321	54321ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3A** Sheet 9 of 9

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56321	56321ZZZ0	
BFV	VLV.BTRFLY	26	48		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 56316	56316ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	60		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS	GASKET	26	60		AWWA-C207 CL.D	NONASBESTOS BS7531 GR X	RING, 150, 3 MM	GK2AX52Z0	155
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH, FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	6	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	8	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3K** Sheet 1 of 5

PIPE CLASS : **A3K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	186
PRESS	10.55	10.55	10.55	10.55	10.55

SERVICE

DEMINERALISED WATER (OUTSIDE DM PLANT BATTERY LIMITS), POLISHED WATER, POLISHED CONDENSATE, DM WATER BEYOND CATEGORY - 'D', NITROGEN, INSTRUMENT AIR(WITHIN UNITS & OFFSITE PACKAGES) - CATEGORY 'D'

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

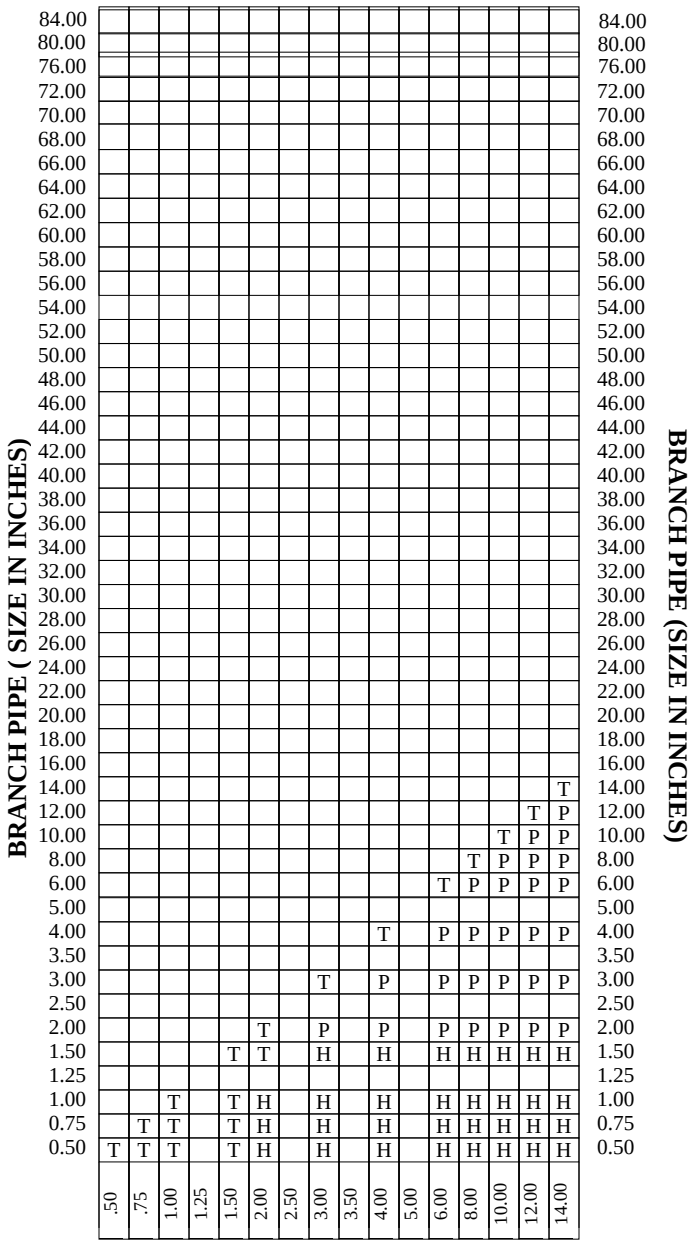
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DC3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VC1	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V1	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3K** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A3K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	14	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z0	
FLG/300	FLNG.WN	2	14	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 182 GR.F304	SCRF, 3000	WF64282Z0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51061	51061ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51361	51361ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52061	52061ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52361	52361ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 53061	53061ZZZ0	

Package : IPMCS
Report No. : 50

A3K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A3K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED			
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53361	53361ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7(GALV), NUT:A194 2H(GALV)		BS40513Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS/300	GASKET	.5	14		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 300, 2 MM	GKBAX54Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 150,FF/125AARH	ST14131Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	14	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 1 of 6

PIPE CLASS : **A40A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	149	204	260
PRESS	18.63	18.63	17.92	16.17	14.06	11.94

SERVICE

NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETC., DRY FLARE, LIQUID DRAIN, PROPYLENE REFRIGERANT, ETHYLENE REFRIGERANT

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

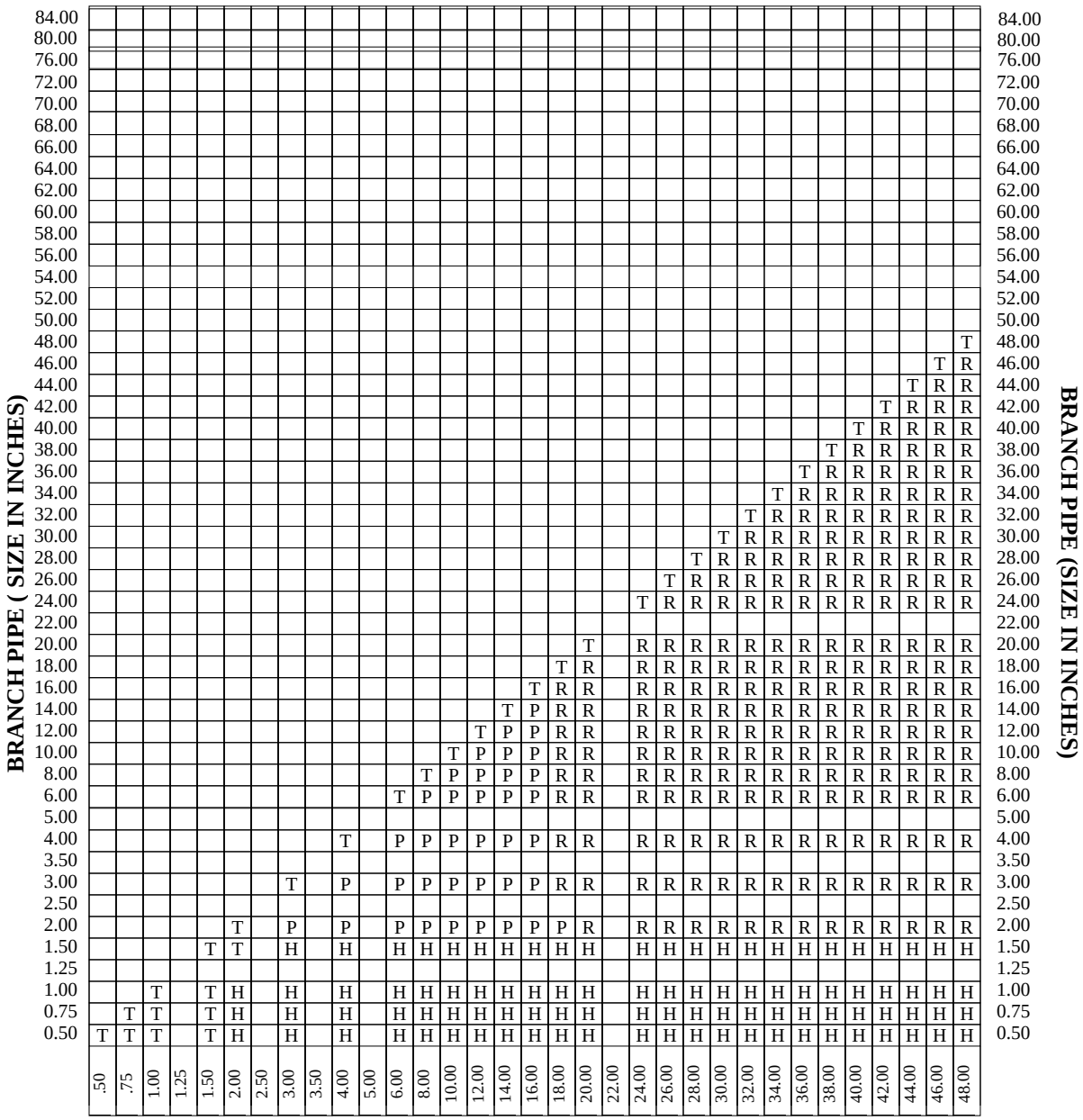
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A40A

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	30	STD	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	32	32	STD	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	32
PIP	PIPE	34	48	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWCD727Z5	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWBD727Z5	
FLG/300	FLNG.WN	26	48	M	B-16.47-B	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWBD747Z5	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBCD727Z5	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBBD727Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FGKD721Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FCKD721Z5	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70(NORMALISED)	150, FF/125AARH	FCU8921Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	48	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51303	51303ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52303	52303ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53303	53303ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54303	54303ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A40A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z5	
GAS/300	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z5	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS316	CONETYPE, 150,FF/125AARH, FF/125AARH	ST1F431Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS316	SW, Y-TYPE, 800	SP3F7D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS316	BW, T-TYPE	SP1F644Z5	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS316	BW, T-TYPE	SP1I344Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :A41A** Sheet 1 of 5

PIPE CLASS : **A41A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

CLEAN HYDROCARBONS VAPOR/LIQUID, OFF GAS, N-HEXANE/C6, BUTENE VAPOR, NITROGEN, LIQUID BUTENE

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

36 PRESSURE BALANCED PLUG VALVES SHALL BE USED ONLY IF SPECIFIED IN P&ID.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

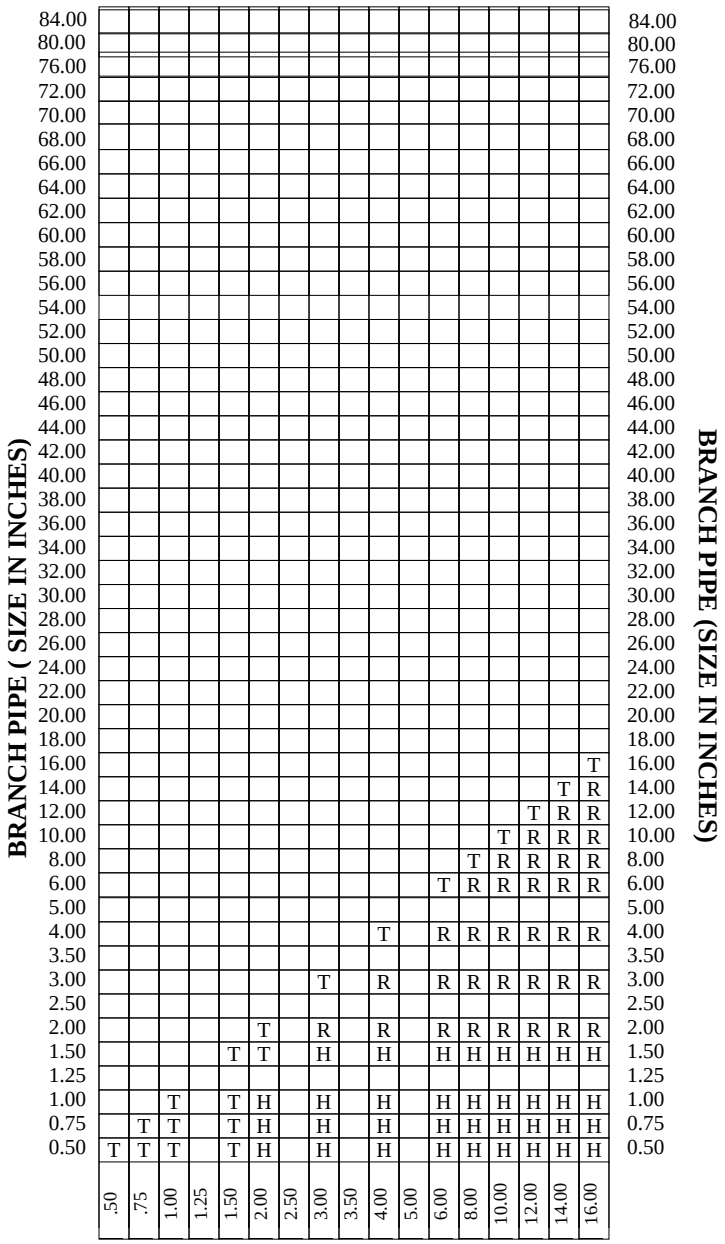
602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A41A

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Location BINA, MADHYA PRADESH	**Pipe Class :A41A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	

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Location BINA, MADHYA PRADESH	**Pipe Class :A41A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	51301ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A41A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13%CR STEEL			
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301	52301ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	53301ZZZ0	
BLV	VLV.BALL	.5	18		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543AE	543AEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	16		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 150,RF/125AARH	TR3065530	
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A41K** Sheet 1 of 5

PIPE CLASS : **A41K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-196	38	93	149	204
PRESS	19.33	19.33	16.17	14.41	13.35

SERVICE

MILD TO MODERATE CORROSIVE PROCESS & HYDROCARBON SERVICES BELOW MINUS 45 DEG C - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL- LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

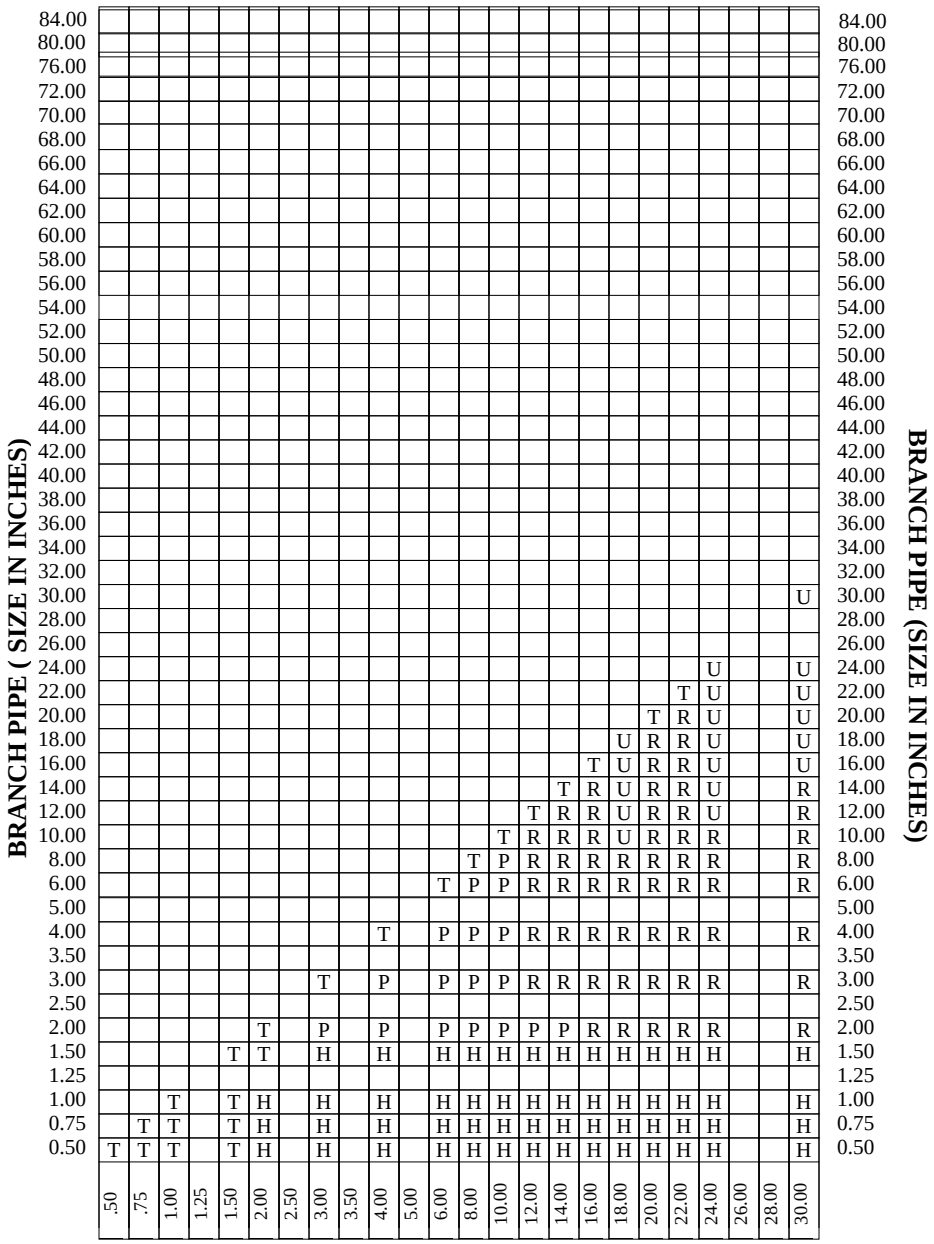
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A41K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A41K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A41K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	10	20	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	22	22	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	24	24	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	30	30	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z4	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z4	
FLG	FLNG.WN	30	30	M	B-16.47-B	ASTM A 182 GR.F304	150, RF/125AARH	FWB4127Z4	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z4	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z4	
FLB	FLNG.BLIND	30	30		B-16.47-B	ASTM A 182 GR.F304	150, RF/125AARH	FBB4127Z4	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z4	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z4	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z4	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z14	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z14	
ELB90	ELBOW.90	30	30	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z14	

Package : IPMCS
Report No. : 50

A41K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A41K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z4	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z14	
ELB45	ELBOW.45	30	30	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z14	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z4	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ4	
TEQ	T.EQUAL	10	30	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ4	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z4	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ4	
TRED	T.RED	10	30	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ4	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ4	
REDC	REDUC.CONC	10	30	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ4	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ4	
REDE	REDUC.ECC	10	30	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ4	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ4	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ4	
CAP	CAP	2	30	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ4	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z4	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z4	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z4	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z4	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 510AL	510ALZZZ4	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A41K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513AL	513ALZZZ4	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 520AL	520ALZZZ4	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523AL	523ALZZZ4	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530AL	530ALZZZ4	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533AL	533ALZZZ4	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SEAT-PCTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543AL	543ALZZZ4	
Bolt Group									
BOS	BOLT.STUD	.5	30		B-18.2	BOLT:A320 GR.B8CL.2, NUT:A194 GR.8		BS41809Z4	
Gasket Group									
GAS	GASKET	.5	30		B-16.20-ANSI B16.5	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 150	GK66472Z4	
GAS/300	GASKET	.5	30		B-16.20-ANSI B16.5	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 300	GK66474Z4	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP316;INT:SS316	CONETYPE, 150,FF/125AARH, FF/125AARH	ST14231Z4	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D514	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z4	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z4	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A42A** Sheet 1 of 5

PIPE CLASS : **A42A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	149	204
PRESS	18.63	18.63	17.92	16.17	14.06

SERVICE

CLEAN HYDROCARBONS (MIXTURE ETHYLENE / BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) - 45°C MINIMUM , LIQUID BUTENE

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

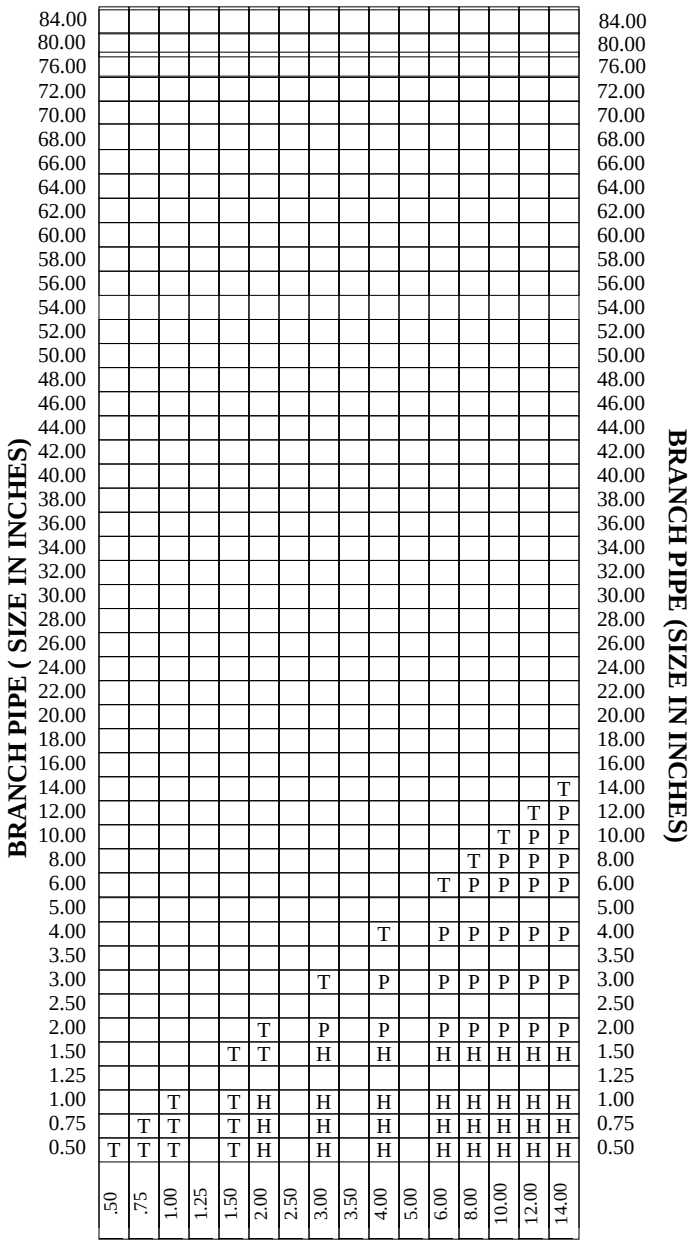
602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A42A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A42A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWCD727Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBCD727Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FGKD721Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FCKD721Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	

Package : **IPMCS**
Report No. : **50**

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A42A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z5	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51303	51303ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52303	52303ZZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A42A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53303	53303ZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543BD	543BDZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 150,FF/125AARH	ST17531Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A42K** Sheet 1 of 6

PIPE CLASS : **A42K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-110	38	93	149	204	260	260
PRESS	19.3	19.3	16.2	14.4	13.4	12	-.6

SERVICE

HYDROCARBONS - FLARE (BASED ON LICENSOR PMS CLASS - LC62)

NOTES

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

96 VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

748 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

779 THIS SPECIFICATION IS RATED FOR NON-CRITICAL VACUUM CONDITIONS. VALVES ARE NOT VACUUM PREPARED OR SUITABLE BY DESIGN FOR CRITICAL VACUUM AND MAY ALLOW LEAKAGE INTO THE SYSTEM.

789 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; PISTON LIFT CHECK; SPRING LOADED; HORIZONTAL TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

816 BOLT LUBRICANT; PASTE BOLT LUBRICANT; NICKEL BASED, ANTISEIZE COMPOUND.

817 FORGED; OS&Y; RISING STEM; REDUCED PORT TYPE; EXTENDED BONNET, BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

818 CAST; FULL PORT TYPE; EXTENDED BONNET, BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 10, GEAR LARGER SIZES

820 FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; EXTENDED BONNET, BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

821 CAST; OS&Y; RISING STEM; EXTENDED BONNET, BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 6, GEAR LARGER SIZES

822 SOCKET WELD END X NPTF; FORGED; OS&Y; RISING STEM; REDUCED PORT TYPE; EXTENDED BONNET, BOLTED; BOLTING:ALLOY 20(UNS N08020)W/FINISHED NUTS; GASKET:CONFINED GRAPHITE/METAL/METAL WITH GRAPHITE;

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API TRIM #12/12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE:DIE FORMED; OPERATOR:HANDWHEEL

888 PICKLED & PASSIVATED.

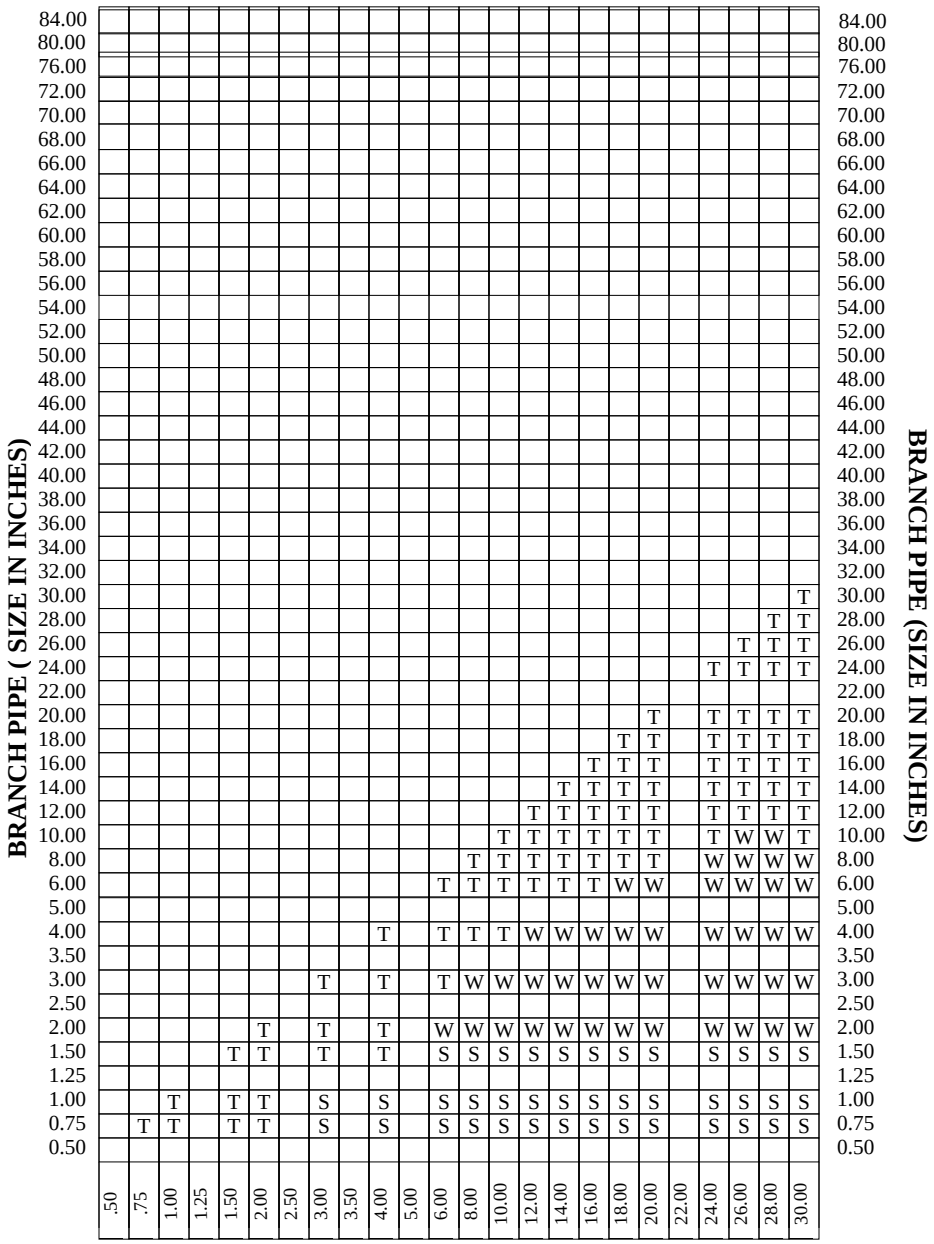
892 LICENSOR PMS LC62 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-892, 28	
	ON LINES >= 2.0"	NOTE-892, 28	
VENTS	ON LINES <= 1.5"	NOTE-892, 28	
	ON LINES >= 2.0"	NOTE-892, 28	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-892)	
PRESS.CONN	0.75"	NOTE-892, 28	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A42K

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Location BINA, MADHYA PRADESH	**Pipe Class :A42K** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z4	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	3	8	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	10	30	10S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z4	888
Flange Group									
FLG	FLNG.WN	.75	24	M	B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWCD827Z4	709
FLG	FLNG.WN	30	30	M	B-16.47-A	ASTM A 182 GR.F304/304L	150, RF/125AARH	FWAD827Z4	709
FLB	FLNG.BLIND	.75	24		B-16.5	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBCD827Z4	709
FLB	FLNG.BLIND	30	30		B-16.47-A	ASTM A 182 GR.F304/304L	150, RF/125AARH	FBAD827Z4	709
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FGKD821Z4	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304/304L	150, FF/125AARH	FCKD821Z4	
Fitting Group									
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z4	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z14	
ELB90	ELBOW.90	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z14	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z4	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z14	
ELB45	ELBOW.45	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z14	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z4	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ4	
TEQ	T.EQUAL	10	30	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ4	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A42K** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z4	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ4	
TRED	T.RED	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ4	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ4	
REDC	REDUC.CONC	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ4	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ4	
REDE	REDUC.ECC	10	30	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ4	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ4	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ4	
CAP	CAP	2	30	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ4	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z4	307
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z4	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z4	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z4	
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z4	
O'let Group									
SLT	SOCKOLET	.75	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z4	
WLT	WELDOLET	2	30	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ4	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.-510EM	510EMZZZ4	817,12
GAV	VLV.GATE	2	14		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513QM	513QMZZZ4	818,12
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS	SPCL, 800, 3000, B-16.11, REFER VMS	510GMZZZ4	822,12,728

Package : IPMCS
Report No. : 50

A42K

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Location BINA, MADHYA PRADESH	**Pipe Class :A42K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						316+STELLITE	SHT, SHT NO.- 510GM		
GLV	VLV.GLOBE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 520TM	520TMZZZ4	820,12
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523QM	523QMZZZ4	821,12
CHV	VLV.CHECK	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 530TM	530TMZZZ4	789
CHV	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533QM	533QMZZZ4	748
Bolt Group									
BOS	BOLT.STUD	.75	30		B-18.2	BOLT:A193 GR.B8MCL.2, NUT:A194 GR.8MA		BS41229Z4	816
Gasket Group									
GAS	GASKET	.75	24		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 150	GK69772Z4	711
GAS	GASKET	30	30		B-16.20-ANSI B16.47A	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 150	GK49772Z4	711

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A43A** Sheet 1 of 5

PIPE CLASS : **A43A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	149	204
PRESS	18.63	18.63	17.92	16.17	14.06

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM , LIQUID BUTENE

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

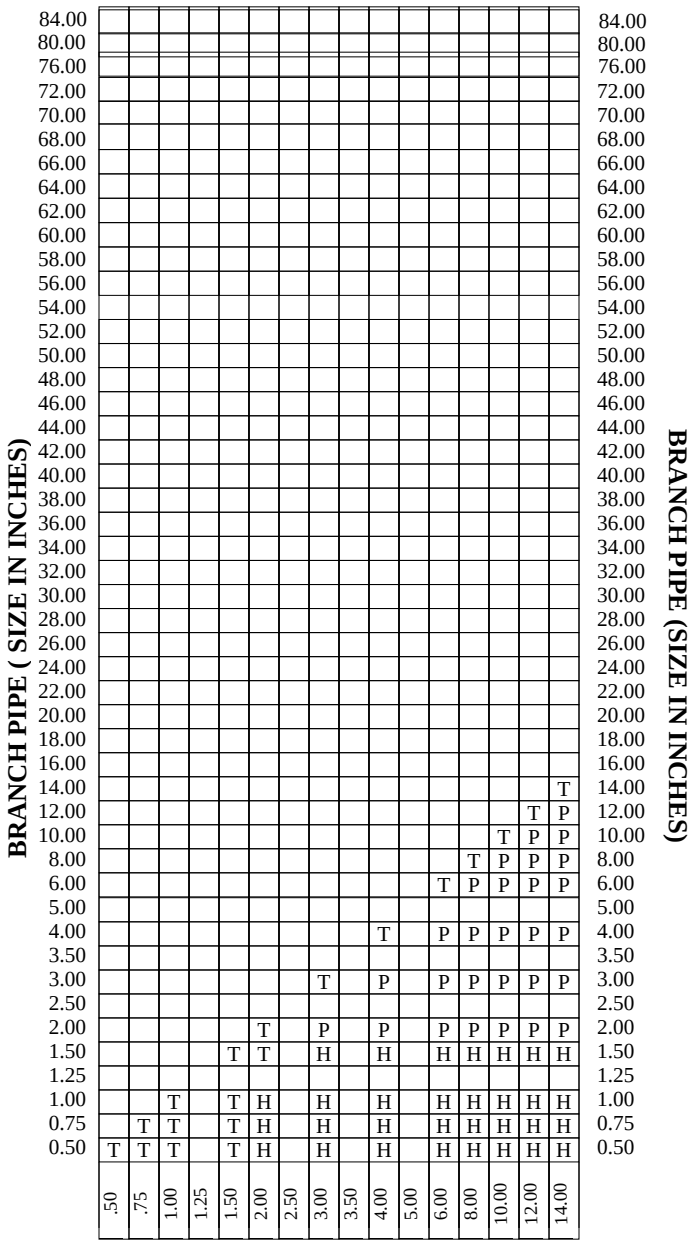
603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A43A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A43A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A43A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWCD727Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBCD727Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FGKD721Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FCKD721Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A43A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DE	513DEZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DD	513DDZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED, STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DE	523DEZZZ5	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DD	523DDZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	FLGD, 150, 3000, B-16.5, RF/125AARH, SHT NO.- 533DE	533DEZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A352 GR.LCB / ASTM	FLGD, 150, B-16.5, RF/125AARH, SHT	533DDZZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A43A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						A350 GR.LF2 CL.1,TRIM-STELLITED	NO.- 533DD		
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIN-BODY SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543DE	543DEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 150,FF/125AARH	ST17531Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44A** Sheet 1 of 5

PIPE CLASS : **A44A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

36 PRESSURE BALANCED PLUG VALVES SHALL BE USED ONLY IF SPECIFIED IN P&ID.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

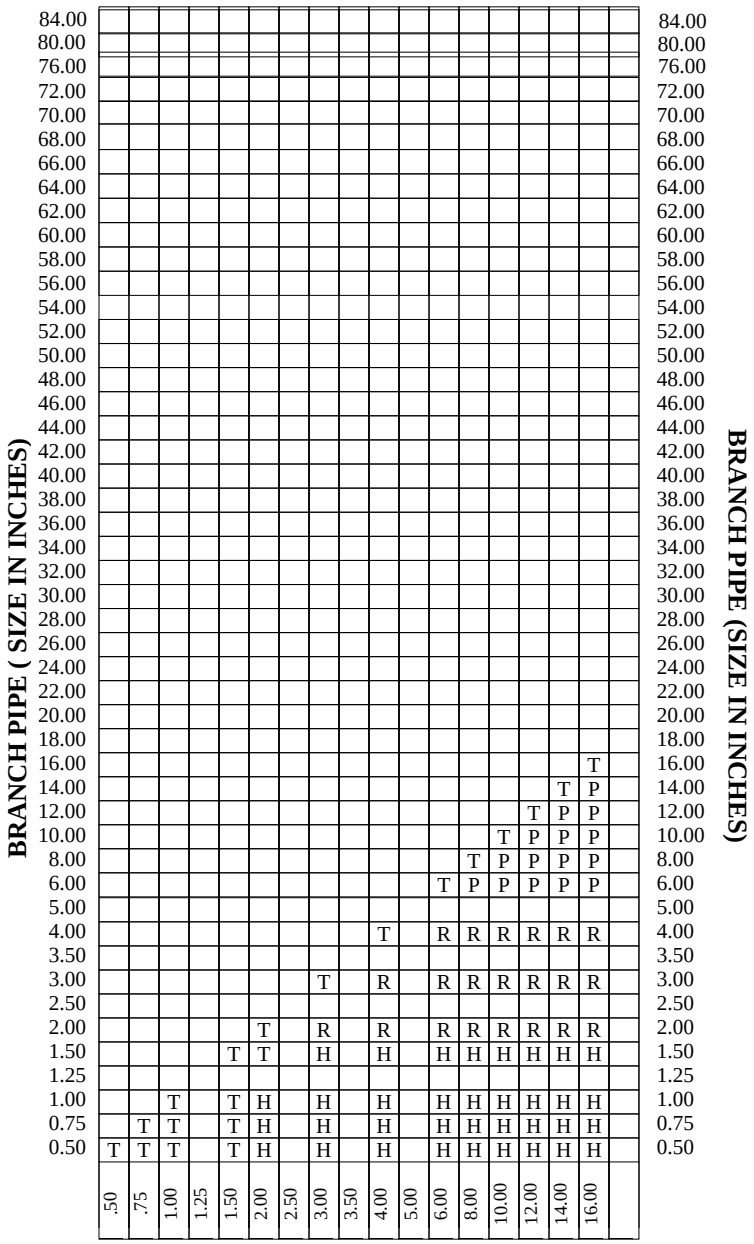
603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A44A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z5	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z5	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z5	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z5	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z15	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z15	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ5	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z5	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z5	
CAP	CAP	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CE	513CEZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CB	513CBZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CE	523CEZZZ5	

Package : IPMCS
Report No. : 50

A44A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13%CR.STEEL			
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CB	523CBZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CE	533CEZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CB	533CBZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543CE	543CEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 150,RF/125AARH	TR3065535	
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44K** Sheet 1 of 5

PIPE CLASS : **A44K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

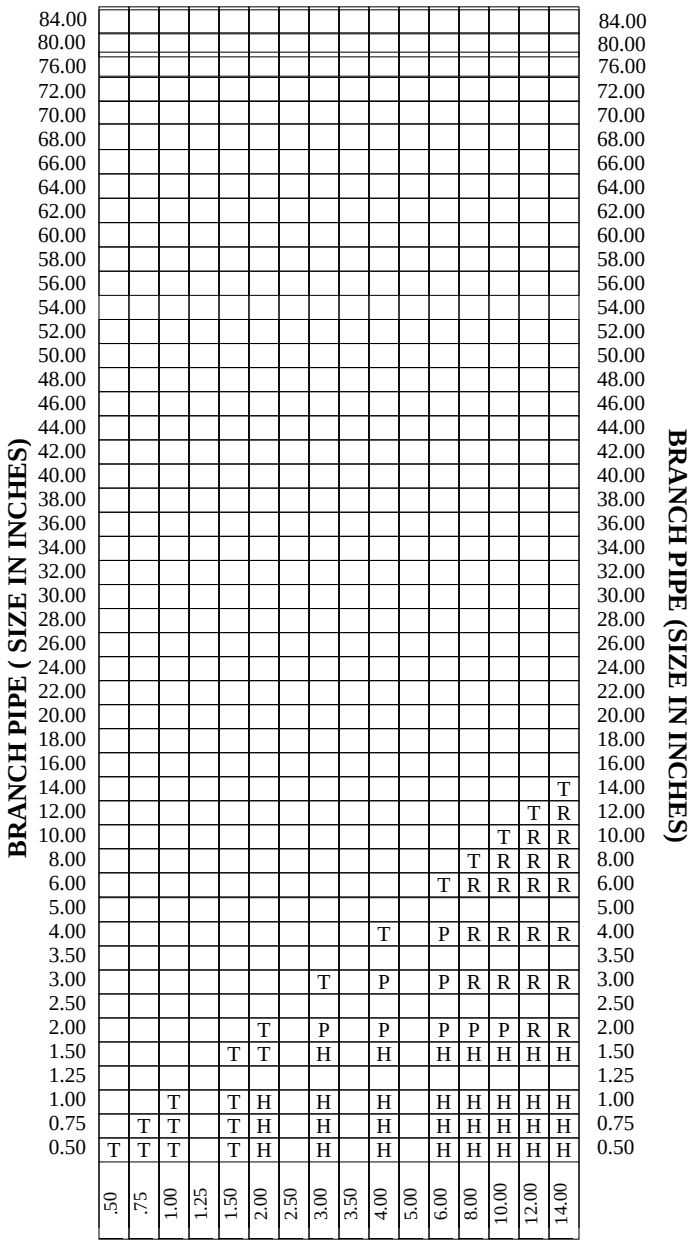
607 ONLY PIPING IS STAINLESS STEEL, VALVES REMAIN IDENTICAL TO PIPING CLASS A44A.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A44K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	14	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	

Package : IPMCS
Report No. : 50

A44K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CE	513CEZZZ0	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CB	513CBZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CE	523CEZZZ0	
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CB	523CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CE	533CEZZZ0	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-	FLGD, 150, B-16.5, RF/125AARH, SHT	533CBZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A44K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13%CR.STEEL, SEATS-STELLITED	NO.- 533CB		
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543CE	543CEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 150,FF/125AARH	ST14131Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	14	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45A** Sheet 1 of 5

PIPE CLASS : **A45A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

SPENT CATALYST, HC SLURRY

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

36 PRESSURE BALANCED PLUG VALVES SHALL BE USED ONLY IF SPECIFIED IN P&ID.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

604 STRAIGHT PIPE RUN SHALL HAVE BREAK UP FLANGES AT EACH 3 METER.

605 PIPE BENDS SHALL HAVE FLANGED ENDS.

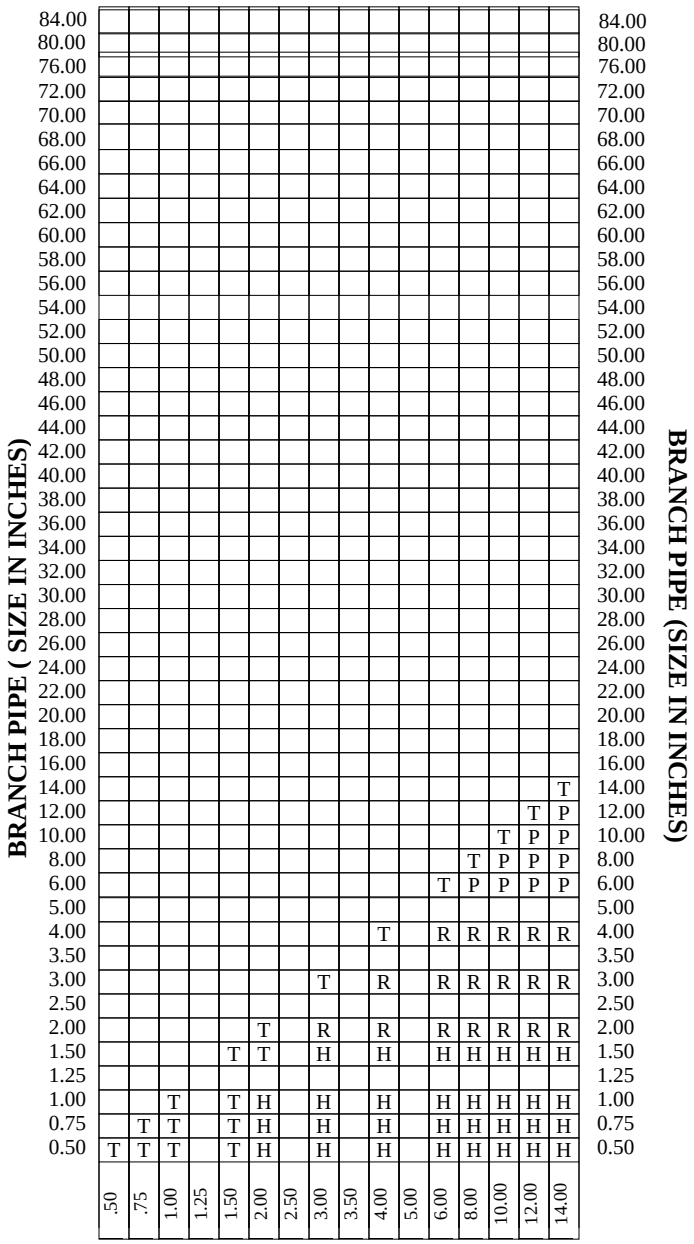
608 THE SPECIAL FLANGES ARE PAD FLANGES TO EIL STD 7-12-0014.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLGD VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A45A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
Fitting Group									
BND	PIPE.BEND	.5	14	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 3D	WCI6843Z0	605
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CE	513CEZZZ0	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CB	513CBZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CE	523CEZZZ0	
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CB	523CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CE	533CEZZZ0	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CB	533CBZZZ0	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543CE	543CEZZZ0	601

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 150,RF/125AARH	TR3065530	
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45K** Sheet 1 of 5

PIPE CLASS : **A45K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE

SPENT CATALYST, HC SLURRY

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

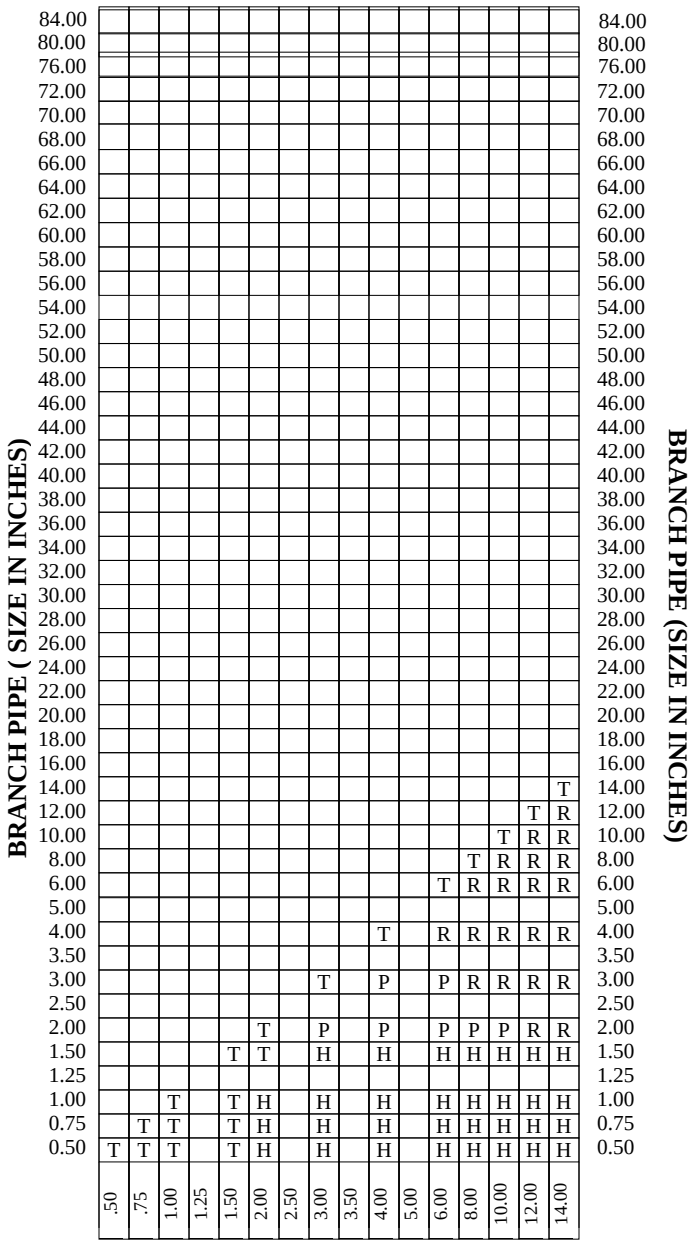
609 ONLY PIPING IS STAINLESS STEEL, VALVES REMAIN IDENTICAL TO PIPING CLASS A45A

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A45K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	14	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	

Package : IPMCS
Report No. : 50

A45K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CE	513CEZZZ0	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CB	513CBZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CE	523CEZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CB	523CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CE	533CEZZZ0	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CB	533CBZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A45K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543CE	543CEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 150,FF/125AARH	ST14131Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	14	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A46A** Sheet 1 of 5

PIPE CLASS : **A46A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	149	204
PRESS	18.63	18.63	17.92	16.17	14.06

SERVICE

HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM, PUMPAROUND, EFFLUENT, EVAPORATION LINES

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

604 STRAIGHT PIPE RUN SHALL HAVE BREAK UP FLANGES AT EACH 3 METER.

605 PIPE BENDS SHALL HAVE FLANGED ENDS.

606 FOR VALVES USED IN POLYMER SERVICE, METAL SEAT SHALL BE USED (NO TEFLON SEAT).

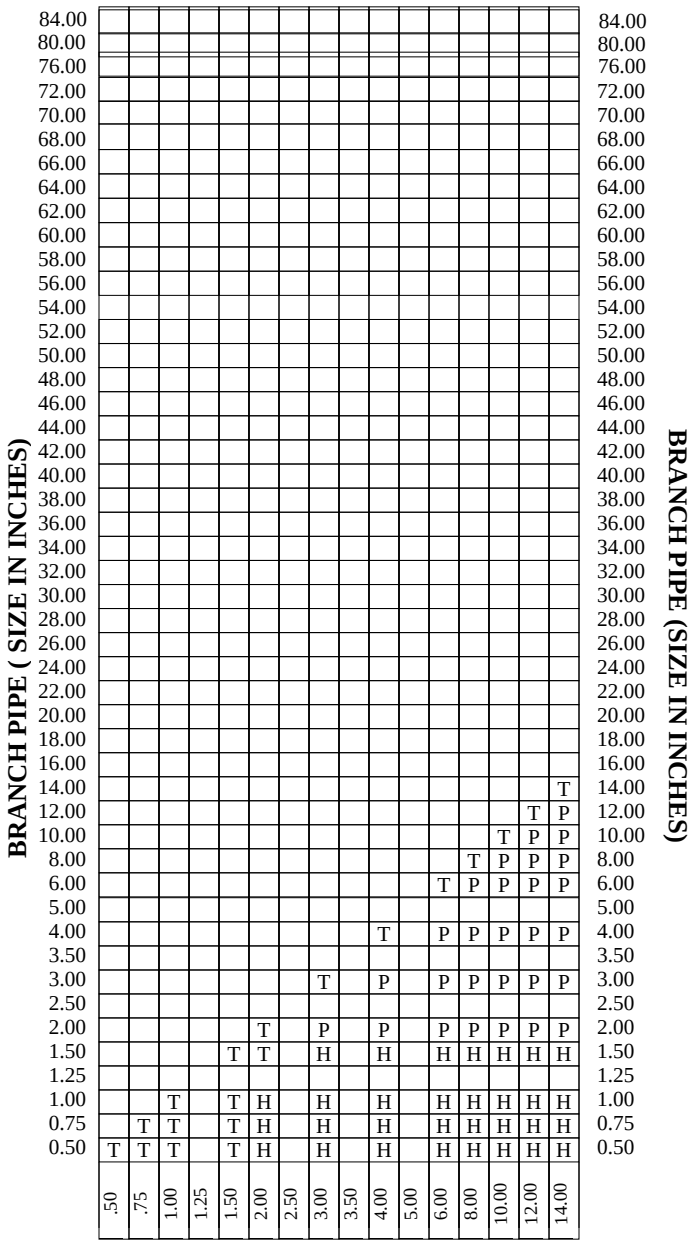
608 THE SPECIAL FLANGES ARE PAD FLANGES TO EIL STD 7-12-0014.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-354	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :A46A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A46A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.WN	.5	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWCD727Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBCD727Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FGKD721Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FCKD721Z5	
Fitting Group									
BND	PIPE.BEND	.5	14	M	ASME B31.3	ASTM A 420 GR.WPL6	BW, 3D	WCIB443Z5	605
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	

Package : **IPMCS**
Report No. : **50**

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Location BINA, MADHYA PRADESH	**Pipe Class :A46A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DE	513DEZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DD	513DDZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED, STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DE	523DEZZZ5	
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DD	523DDZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	FLGD, 150, 3000, B-16.5, RF/125AARH, SHT NO.- 533DE	533DEZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533DD	533DDZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543FE	543FEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A46A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 150,FF/125AARH	ST17531Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 1 of 6

PIPE CLASS : **A4A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	149	204
PRESS	18.63	18.63	17.92	16.17	14.06

SERVICE

NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, VENTS(HIGH TEMPERATURE) ETC.

NOTES

1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

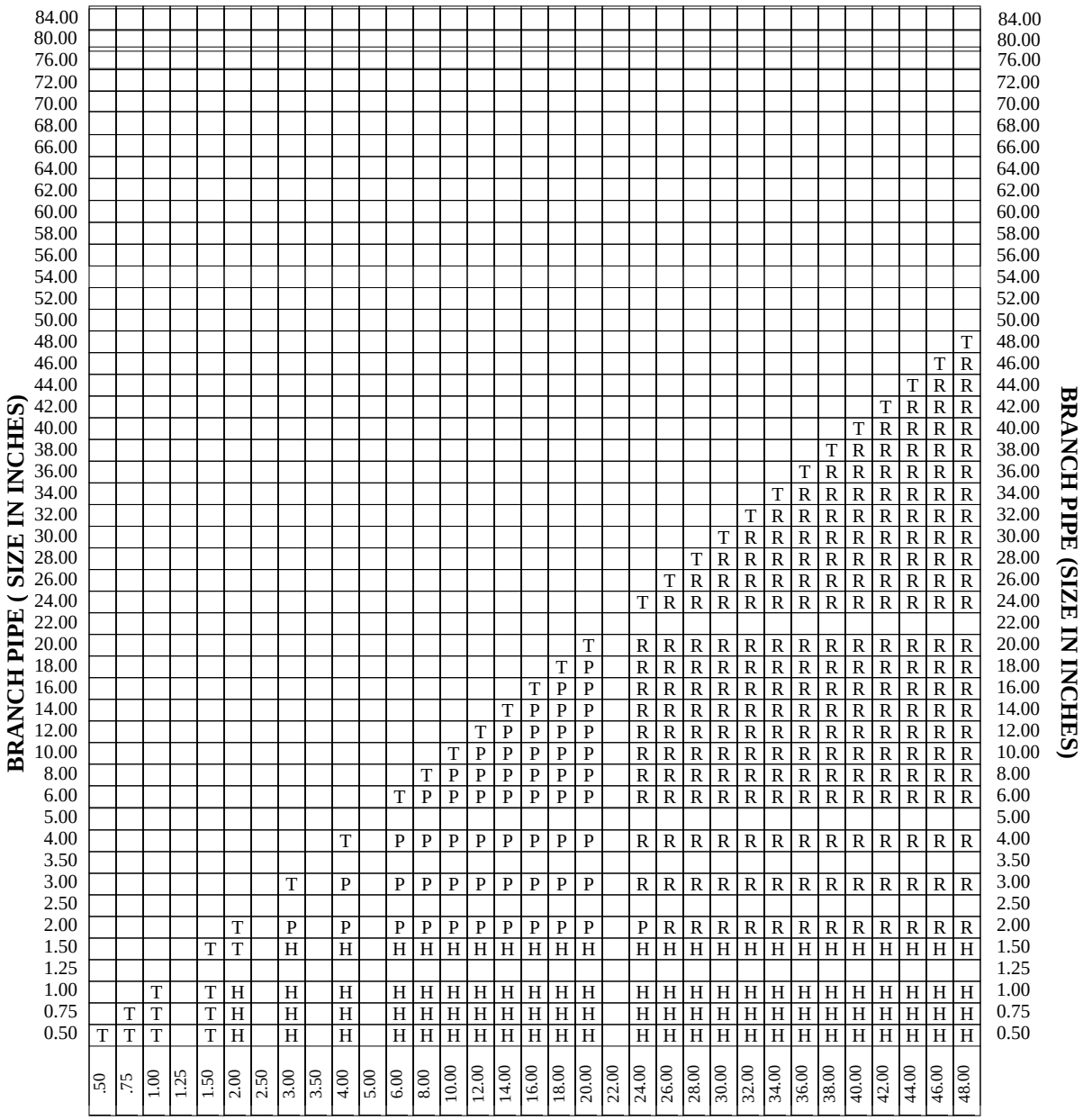
960 FOR LICENSOR SPECIFICATION L2C61 IN PPU, FOR SIZE RANGE 0.75" TO 10": STR-406 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A4A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	36	STD	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	38	48	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWCD727Z5	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FWBD727Z5	
FLG/300	FLNG.WN	26	48	M	B-16.47-B	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWBD747Z5	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBCD727Z5	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 350 GR.LF2 CL.1	150, RF/125AARH	FBBD727Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FGKD721Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	150, FF/125AARH	FCKD721Z5	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70(NORMALISED)	150, FF/125AARH	FCU8921Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	48	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51303	51303ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52303	52303ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53303	53303ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54303	54303ZZZ5	
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 352 GR.LCB,TRIM-SS 304	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56303	56303ZZZ5	
BFV	VLV.BTRFLY	26	36		BS EN 593	BODY-ASTM A 352 GR.LCB,TRIM-SS 304	FLGD, 150, B-16.47 B, RF/125AARH, SHT NO.- 56317	56317ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	

Package : IPMCS
Report No. : 50

A4A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A4A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z5	
GAS	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z5	
GAS/300	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z5	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 150,FF/125AARH	ST17531Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS304	BW, T-TYPE	SP16644Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A60K** Sheet 1 of 5

PIPE CLASS : **A60K**
RATING : 150
BASE MATERIAL : SS 304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : NACE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	16.17	16.17	13.71	12.3	11.3

SERVICE

RICH AMINE, RICH AMINE WITH FLASHING H2S

NOTES

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

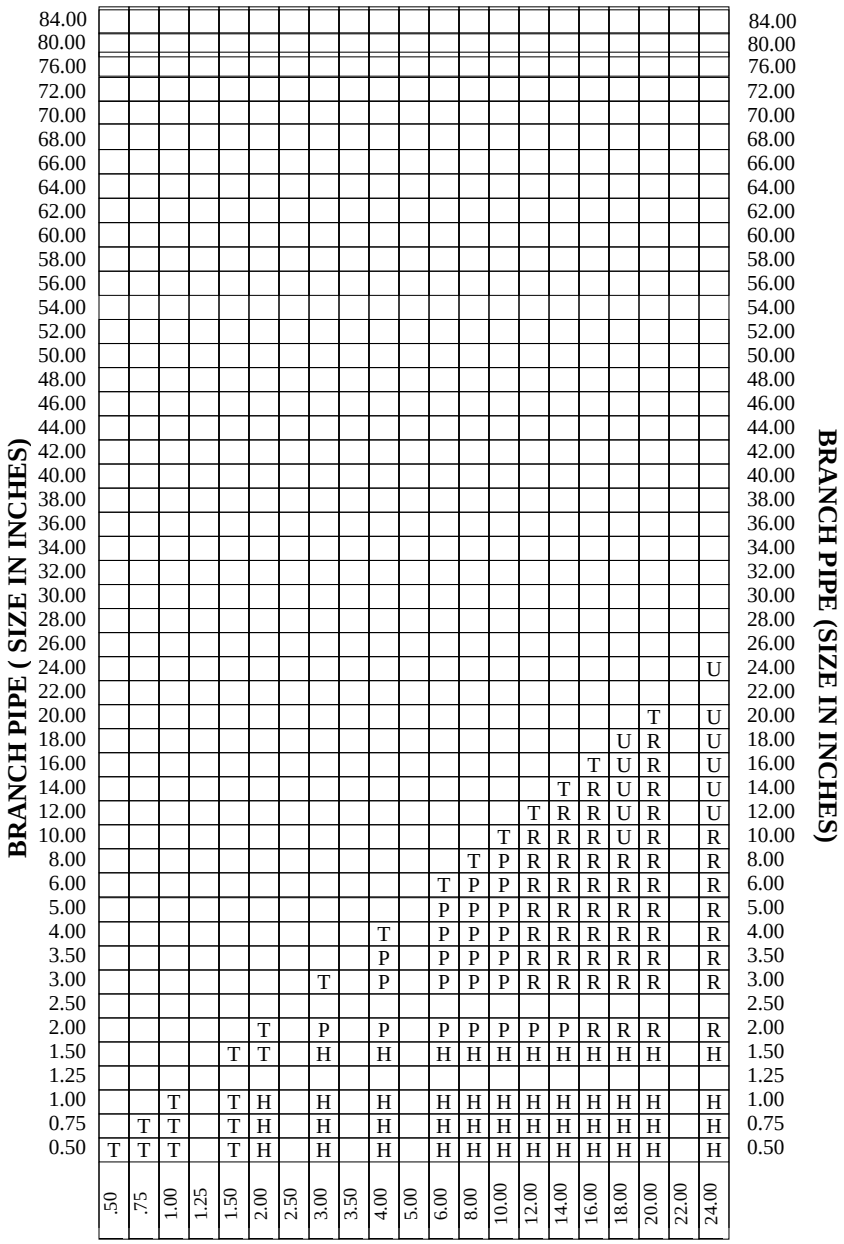
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A60K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A60K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A60K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z2	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z2	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z2	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z2	
PIP	PIPE	10	20	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z2	
PIP	PIPE	24	24	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z2	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z2	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z2	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FSC4347Z2	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304L	150, RF/125AARH	FWC4327Z2	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FWC4347Z2	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304L	150, RF/125AARH	FBC4327Z2	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304L	150, FF/125AARH	FGK4321Z2	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304L	150, FF/125AARH	FCK4321Z2	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WA644D2Z2	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WAG934Z12	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW, 1.5D	WAG954Z12	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WB644D2Z2	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WBG934Z12	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW, 1.5D	WBG954Z12	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WE644D2Z2	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WEG934ZZ2	

Package : IPMCS
Report No. : 50

A60K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A60K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WEG954ZZ2	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WR644D2Z2	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WRG934ZZ2	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WRG954ZZ2	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WUG934ZZ2	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WUG954ZZ2	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WVG934ZZ2	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WVG954ZZ2	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WNH446ZZ2	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WPH446ZZ2	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WFG934ZZ2	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WJ644D2Z2	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WK644D2Z2	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WL644D2Z2	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WM644D2Z2	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.-510AM	510AMZZZ2	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513AM	513AMZZZ2	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.-520AM	520AMZZZ2	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523AM	523AMZZZ2	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-	SW, 800, 3000, B-16.11, SHT NO.-	530AMZZZ2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A60K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED	530AM		
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF3M,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533AM	533AMZZZ2	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z2	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z2	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 1 of 6

PIPE CLASS : **A61A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : NACE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE

AMINE, SOUR HYDROCARBONS (H2S), SOUR WATER, STABILIZER COLUMN OVERHEAD (H2S ENVIRONMENT), ACID FLARE, METHANOL, AMINE CLOSED BLOWDOWN(MED).

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.

35 ALL TYPES OF WELDS INCLUDING GIRTH WELDS SHALL BE WET FLOURESCENT MP TESTED.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

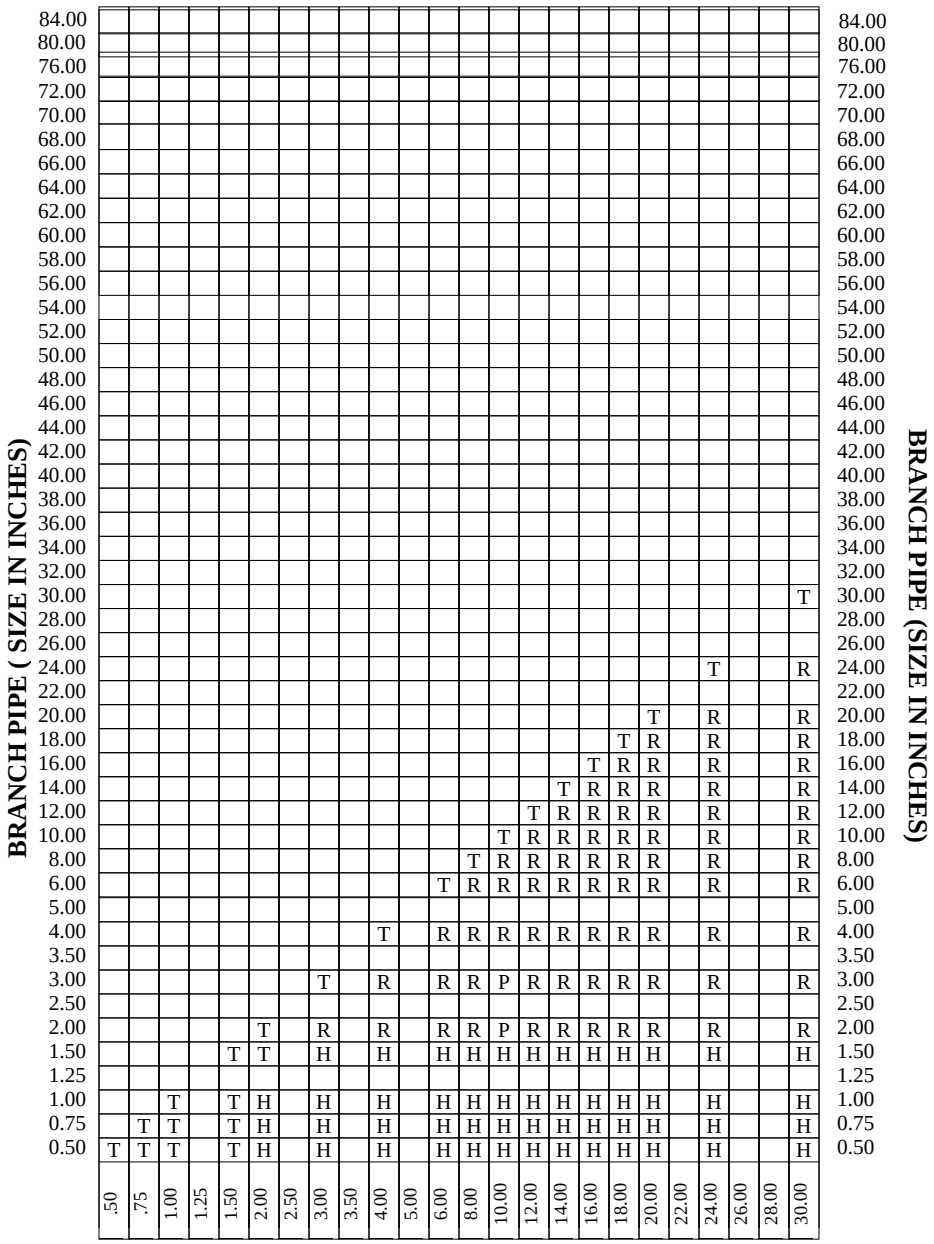
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A61A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z2	
PIP	PIPE	30	30	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z2	32
NIP/	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z2	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z2	
FLG	FLNG.WN	30	30	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z2	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z2	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z2	
FLB	FLNG.BLIND	30	30		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z2	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z2	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z2	
FEF	SPCR&BLND	30	30		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z2	
Fitting Group									
ELB90	ELBOW.90	.5	.5		B-16.11	ASTM A 105	SW, 9000	WA602D4Z2	
ELB90	ELBOW.90	.75	1		B-16.11	ASTM A 105	SW, 6000	WA602D3Z2	
ELB90	ELBOW.90	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z2	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z12	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z12	
ELB90	ELBOW.90	30	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z12	

Package : IPMCS
Report No. : 50

A61A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.5		B-16.11	ASTM A 105	SW, 9000	WB602D4Z2	
ELB45	ELBOW.45	.75	1		B-16.11	ASTM A 105	SW, 6000	WB602D3Z2	
ELB45	ELBOW.45	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z2	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z12	
ELB45	ELBOW.45	30	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z12	
TEQ	T.EQUAL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WE602D4Z2	
TEQ	T.EQUAL	.75	1		B-16.11	ASTM A 105	SW, 6000	WE602D3Z2	
TEQ	T.EQUAL	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z2	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ2	
TEQ	T.EQUAL	16	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ2	
TRED	T.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WR602D4Z2	
TRED	T.RED	.75	1		B-16.11	ASTM A 105	SW, 6000	WR602D3Z2	
TRED	T.RED	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z2	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ2	
TRED	T.RED	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ2	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ2	
REDC	REDUC.CONC	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ2	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ2	
REDE	REDUC.ECC	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ2	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ2	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ2	
CAP	CAP	2	30	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ2	
CPLF	CPLNG.FULL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WJ602D4Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.75	1		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z2	
CPLF	CPLNG.FULL	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z2	
CPLH	CPLNG.HALF	.5	.5		B-16.11	ASTM A 105	SW, 9000	WK602D4Z2	
CPLH	CPLNG.HALF	.75	1		B-16.11	ASTM A 105	SW, 6000	WK602D3Z2	
CPLH	CPLNG.HALF	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z2	
CPLL	CPLNG.LH	.5	.5		B-16.11	ASTM A 105	SW, 9000	WL602D4Z2	
CPLL	CPLNG.LH	.75	1		B-16.11	ASTM A 105	SW, 6000	WL602D3Z2	
CPLL	CPLNG.LH	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z2	
CPLR	CPLNG.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WM602D4Z2	
CPLR	CPLNG.RED	.75	1		B-16.11	ASTM A 105	SW, 6000	WM602D3Z2	
CPLR	CPLNG.RED	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z2	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 51011	51011ZZZ2	
GAV	VLV.GATE	2	30		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51311	51311ZZZ2	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 52011	52011ZZZ2	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52311	52311ZZZ2	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53011	53011ZZZ2	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53311	53311ZZZ2	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55311	55311ZZZ2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A61A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	30		B-18.2	BOLT:A193 GR.B7M, NUT:A194 GR.2HM		BS43405Z2	
Gasket Group									
GAS	GASKET	.5	30		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z2	
GAS/300	GASKET	.5	30		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z2	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS316L	CONETYPE, 150,FF/125AARH	ST16931Z2	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316L	SW, Y-TYPE, 800	SP305D512	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS316L	BW, T-TYPE	SP14044Z2	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS316L	BW, T-TYPE	SP13844Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 1 of 6

PIPE CLASS : **A62A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 6 MM
SPECIAL REQUIREMENT : NACE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE

AMINE, RICH AMINE WITH FLASHING H2S

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.

35 ALL TYPES OF WELDS INCLUDING GIRTH WELDS SHALL BE WET FLOURESCENT MP TESTED.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

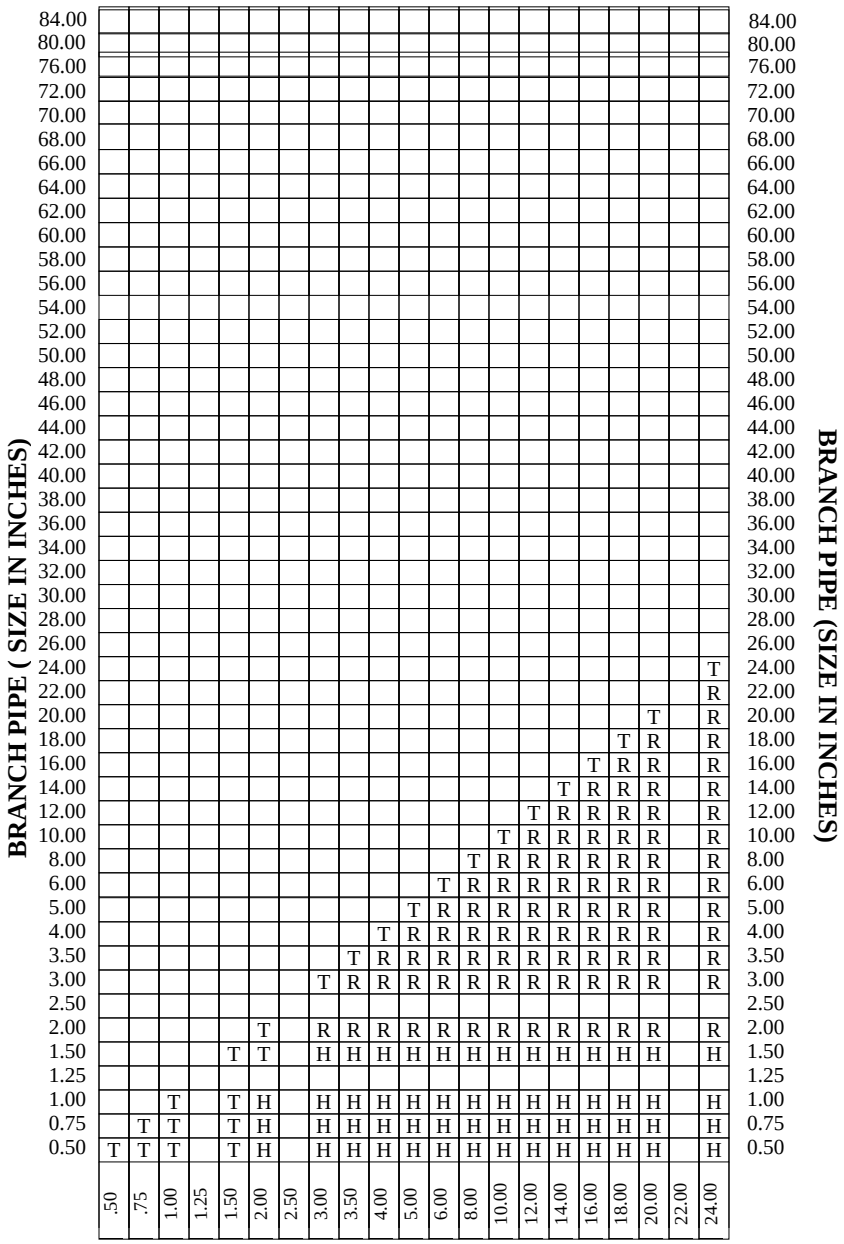
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	XXS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	1.5	1.5	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	32
PIP	PIPE	2	2	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	3	6	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	8	8	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	32
PIP	PIPE	10	12	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	14	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	32
PIP	PIPE	16	24	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z2	
NIP	NIPPLE	.5	.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
NIP	NIPPLE	.75	1	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
NIP	NIPPLE	1.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	32
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z2	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z2	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z2	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z2	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z2	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z2	
Fitting Group									
ELB90	ELBOW.90	.5	.5		B-16.11	ASTM A 105	SW, 9000	WA602D4Z2	
ELB90	ELBOW.90	.75	1		B-16.11	ASTM A 105	SW, 6000	WA602D3Z2	
ELB90	ELBOW.90	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z2	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z12	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z12	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.5		B-16.11	ASTM A 105	SW, 9000	WB602D4Z2	
ELB45	ELBOW.45	.75	1		B-16.11	ASTM A 105	SW, 6000	WB602D3Z2	
ELB45	ELBOW.45	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z2	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z12	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z12	
TEQ	T.EQUAL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WE602D4Z2	
TEQ	T.EQUAL	.75	1		B-16.11	ASTM A 105	SW, 6000	WE602D3Z2	
TEQ	T.EQUAL	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z2	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ2	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ2	
TRED	T.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WR602D4Z2	
TRED	T.RED	.75	1		B-16.11	ASTM A 105	SW, 6000	WR602D3Z2	
TRED	T.RED	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z2	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ2	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ2	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ2	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ2	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ2	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ2	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ2	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ2	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ2	
CPLF	CPLNG.FULL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WJ602D4Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.75	1		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z2	
CPLF	CPLNG.FULL	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z2	
CPLH	CPLNG.HALF	.5	.5		B-16.11	ASTM A 105	SW, 9000	WK602D4Z2	
CPLH	CPLNG.HALF	.75	1		B-16.11	ASTM A 105	SW, 6000	WK602D3Z2	
CPLH	CPLNG.HALF	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z2	
CPLL	CPLNG.LH	.5	.5		B-16.11	ASTM A 105	SW, 9000	WL602D4Z2	
CPLL	CPLNG.LH	.75	1		B-16.11	ASTM A 105	SW, 6000	WL602D3Z2	
CPLL	CPLNG.LH	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z2	
CPLR	CPLNG.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WM602D4Z2	
CPLR	CPLNG.RED	.75	1		B-16.11	ASTM A 105	SW, 6000	WM602D3Z2	
CPLR	CPLNG.RED	1.5	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z2	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 51011	51011ZZZ2	
GAV	VLV.GATE	2	30		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51311	51311ZZZ2	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 52011	52011ZZZ2	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52311	52311ZZZ2	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53011	53011ZZZ2	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53311	53311ZZZ2	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55311	55311ZZZ2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A62A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7M, NUT:A194 GR.2HM		BS43405Z2	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z2	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z2	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS316L	CONETYPE, 150,FF/125AARH	ST16931Z2	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316L	SW, Y-TYPE, 800	SP305D512	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS316L	BW, T-TYPE	SP14044Z2	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS316L	BW, T-TYPE	SP13844Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A69M** Sheet 1 of 4

PIPE CLASS : **A69M**
RATING : 150
BASE MATERIAL : SS 316/316L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	19.33	19.33	16.52	15.11	13.71

SERVICE

SPENT CAUSTIC

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

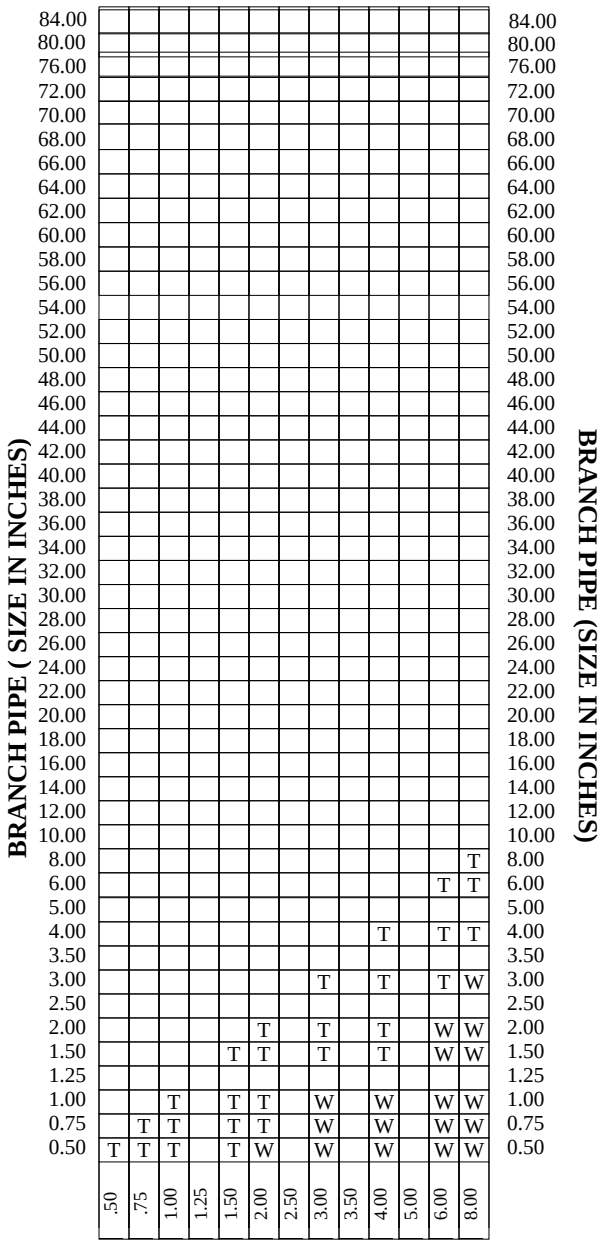
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A69M** Sheet 2 of 4



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A69M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A69M** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
NIP/	NIPPLE	.5	.75	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
NIP/	NIPPLE	1	1.5	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
Flange Group									
FLG	FLNG.WN	.5	8	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	150, RF/125AARH	FWCF727Z0	
FLB	FLNG.BLIND	.5	8		B-16.5	ASTM A 182 GR.F316/316L DUAL	150, RF/125AARH	FBCF727Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	150, FF/125AARH	FGKF721Z0	
Fitting Group									
ELB90	ELBOW.90	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WAGX24Z10	
ELB45	ELBOW.45	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WBGX24Z10	
TEQ	T.EQUAL	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WEGX24ZZ0	
TRED	T.RED	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WRGX24ZZ0	
REDC	REDUC.CONC	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WUGX24ZZ0	
REDE	REDUC.ECC	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WVGX24ZZ0	
CAP	CAP	.5	8	M	B-16.9	ASTM A403	BW	WFGX24ZZ0	

Package : IPMCS
Report No. : 50

A69M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A69M** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
						GR.WP316/316L-S DUAL			
O'let Group									
WLT	WELDOLET	.5	8	M, M	MSS-SP97	ASTM A182 GR.F316/316L DUAL	BW	YWSX14ZZ0	
Valves Group									
GAV	VLV.GATE	.5	8		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DN	513DNZZZ0	
GLV	VLV.GLOBE	.5	8		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DN	523DNZZZ0	
CHV	VLV.CHECK	.5	8		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533DN	533DNZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	8		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	8		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A6K** Sheet 1 of 5

PIPE CLASS : **A6K**
RATING : 150
BASE MATERIAL : SS 304L
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	16.17	16.17	13.71	12.3	11.24	10.54	9.84	8.78	7.73

SERVICE

CORROSIVE PROCESS SERVICE - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL - FLARE GAS, ACID GAS WITH CONDENSATE, REFLUX, CORROSIVE WATER, RICH AMINE, ETC.

NOTES

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

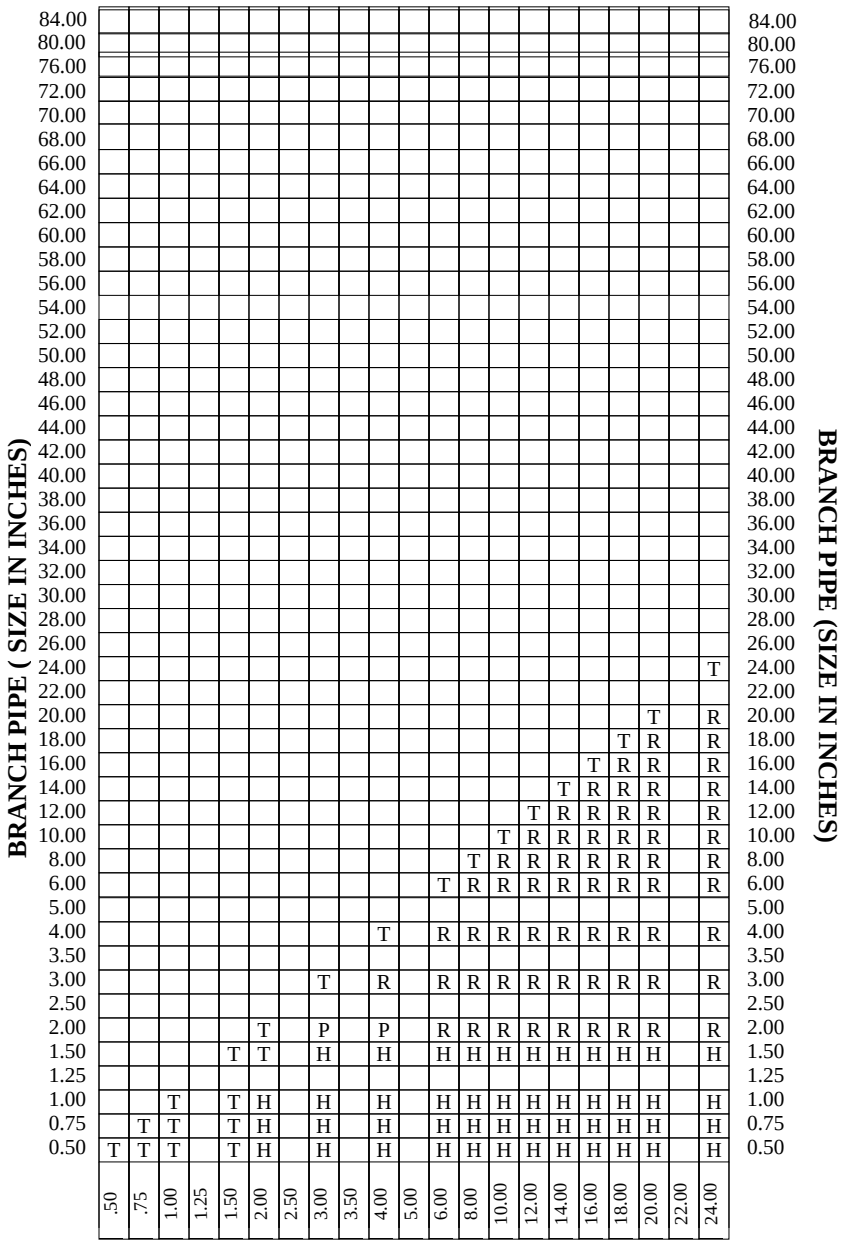
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A6K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A6K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A6K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z0	
PIP	PIPE	10	14	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z0	
PIP	PIPE	16	16	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z0	32
PIP	PIPE	18	18	6.35	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z0	
PIP	PIPE	20	20	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z0	32
PIP	PIPE	24	24	10S	B-36.19	ASTM A 358 TP304L CL.1	BE, E.FS.W	PI36213Z0	32
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FSC4347Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304L	150, RF/125AARH	FWC4327Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FWC4347Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304L	150, RF/125AARH	FBC4327Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304L	150, FF/125AARH	FGK4321Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304L	150, FF/125AARH	FCK4321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WA644D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WAG934Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW, 1.5D	WAG954Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WB644D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WBG934Z10	

Package : IPMCS
Report No. : 50

A6K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A6K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW, 1.5D	WBG954Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WE644D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WEG934ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WEG954ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WR644D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WRG934ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WRG954ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WUG934ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WUG954ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WVG934ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304L-WX	BW	WVG954ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WNH446ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WPH446ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WFG934ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WJ644D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WK644D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WL644D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WM644D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304L,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 51050	51050ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF3,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51350	51350ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304L,TRIM-STELLITED,STEM-	SW, 800, 3000, B-16.11, SHT NO.- 52050	52050ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A6K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						SS 316L			
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF3,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52350	52350ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304L,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53050	53050ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF3,TRIM-SS 316L	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53350	53350ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 1 of 6

PIPE CLASS : **A71A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

BT EXTRACTION W/FV

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

40 STIFFENER RINGS, IF NEEDED, SHALL BE PROVIDED AS PER ASME SEC. VIII, DIV. 1

96 VALVE TO BE TESTED FOR VACUUM AS PER ASME V, SUBSECTION-A, ARTICLE 10 (HOOD METHOD) APPENDIX IX TO CHECK SUITABILITY FOR VACUUM SERVICE.

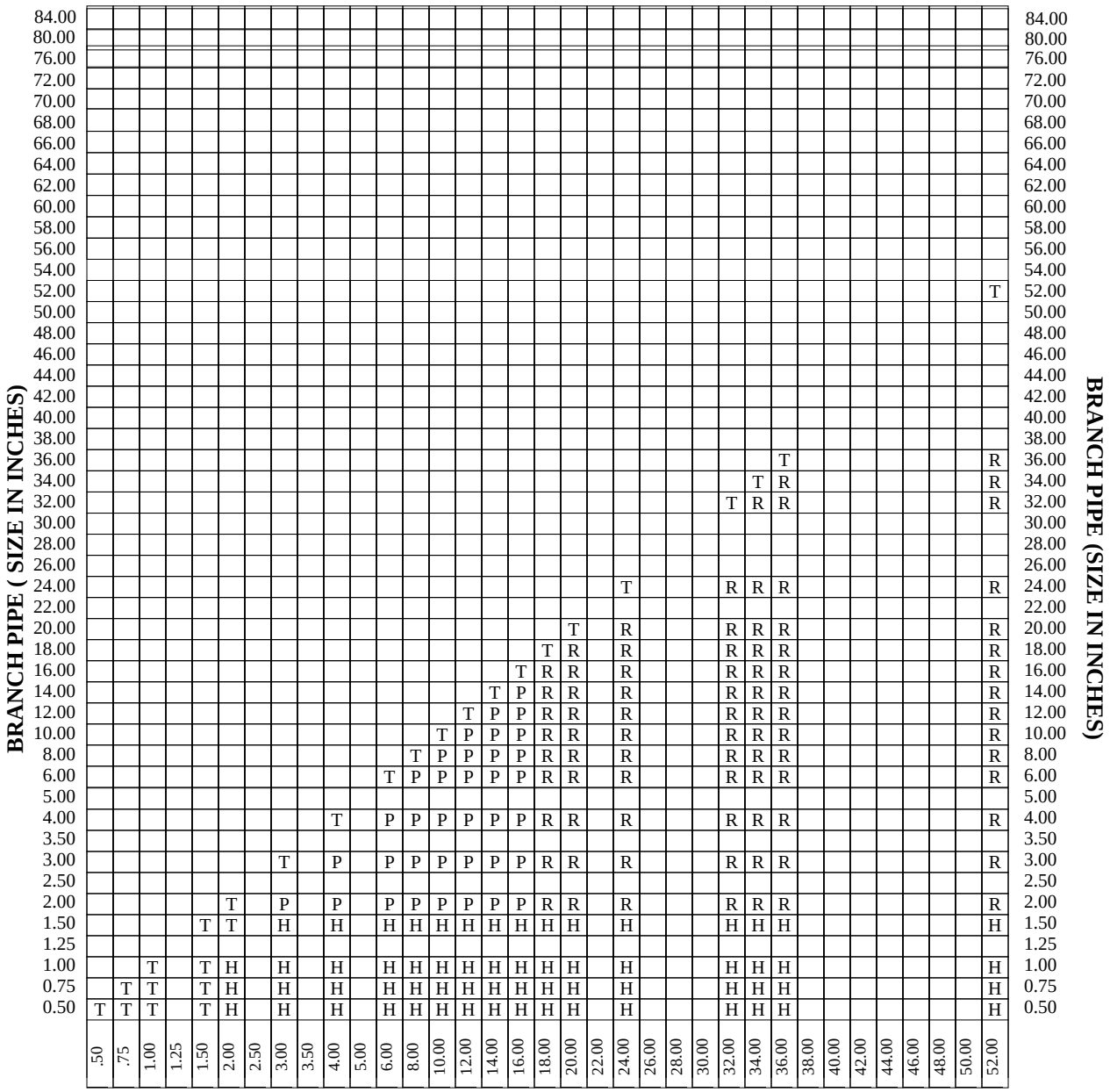
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A71A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	32	36	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	52	52	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	32
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG	FLNG.WN	32	36	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG	FLNG.WN	52	52	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	32	36		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FLB	FLNG.BLIND	52	52		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	32	36		EIL'STD	ASTM A 516 GR.70	150, FF/125AARH	FCE6321Z0	
FEF	SPCR&BLND	52	52		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	32	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	52	52	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WAM754Z10	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	32	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	52	52	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WBM754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	52	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	52	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	36	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	52	52	M	JOB'STD	ASTM A 234 GR.WPB	BW	WFM684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51007	51007ZZZ0	
GAV	VLV.GATE	2	42		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51307	51307ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52007	52007ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52307	52307ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53007	53007ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53307	53307ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54307	54307ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A71A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						BODY SEAT-RPTFE			
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55307	55307ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	52		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	32	52		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 1 of 6

PIPE CLASS : **A81A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	165	177
PRESS	20.03	20.03	18.27	16.17	14.06	7.03

SERVICE

ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.)
(BASED ON LICENSOR PMS CLASS - 1C17)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

302 ONLY DEPEND UPON P&ID NOTE.

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

341 PIPING SHALL PASS A SENSITIVE LEAK TEST IN ACCORDANCE WITH PPM-570 PRIOR TO INITIAL OPERATION.

345 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE THREAD DOPE WHERE SEAL WELDING AND COVER ALL EXPOSED THREADS WITH WELD.

346 SAFEGUARD AND SUPPORT NPS 0.5" PIPING IN STRUCTURAL CHANNEL MATERIAL.

612 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1C17

635 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. LONG LINES SHOULD USE SW COUPLINGS.

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

638 REFER LICENSOR SPECIFICATION FOR STR-351 FOR STRAINERS.

665 GRAFOIL FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

977 TO BE USED IN DC, TT AND OTHER CHLORINATED HYDROCARBON SERVICE

978 NOT TO BE USED FOR DC, TT OR OTHER CHLORINATED HYDROCARBON SERVICE

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 3 of 6

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	
84.00									84.00
80.00									80.00
76.00									76.00
72.00									72.00
70.00									70.00
68.00									68.00
66.00									66.00
64.00									64.00
62.00									62.00
60.00									60.00
58.00									58.00
56.00									56.00
54.00									54.00
52.00									52.00
50.00									50.00
48.00									48.00
46.00									46.00
44.00									44.00
42.00									42.00
40.00									40.00
38.00									38.00
36.00									36.00
34.00									34.00
32.00									32.00
30.00									30.00
28.00									28.00
26.00									26.00
24.00									24.00
22.00									22.00
20.00									20.00
18.00									18.00
16.00									16.00
14.00									14.00
12.00									12.00
10.00									10.00
8.00									8.00
6.00									6.00
5.00									5.00
4.00									4.00
3.50									3.50
3.00								T	3.00
2.50									2.50
2.00						T		P	2.00
1.50					T	T		H	1.50
1.25									1.25
1.00			T		T	H		H	1.00
0.75		T	T		T	H		H	0.75
0.50	T	T	T		T	H		H	0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A81A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.WN	.5	3	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YES02D2Z0	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YLS02D2Z0	311
Valves Group									
CHV	VLV.CHECK	.5	.75		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,SEAT-SS316	SW, 800, 3000, B-16.11, SHT NO.-530MA	530MAZZZ0	612
CHV	VLV.CHECK	1	3		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS316 ; SEAT-TEFLON O RING	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 533MA	533MAZZZ0	612
BLV	VLV.BALL	.5	1.5		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS316; SEAT-RPTFE	SW, 800, 3000, B-16.11, SHT NO.-540MA	540MAZZZ0	612,978
BLV	VLV.BALL	2	3		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL + STEM- SS316 ; SEAT- RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543MA	543MAZZZ0	612,978
BLV/4	VLV.BALL	.5	.75		MNF'STD	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.-	540CDZZZ0	977,612

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
							540CD		
BLV/3	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-K-MONEL; SEAT : RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540BA	540BAZZZ0	977,612
BLV/2	VLV.BALL	.5	1.5		API-608	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543BA	543BAZZZ0	977,612
BLV/1	VLV.BALL	.5	1		MNF'STD	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS316; SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540QA	540QAZZZ0	312,612, 978
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	3		API-601	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK16272Z0	665
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A216GR.WCB;INT:SS304	SW, Y-TYPE, 800	SP380D510	637
PSR	STRNR.PERM	2	3		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 150,RF/125AARH, LGFM/125AARH	SP3805530	638

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 1 of 6

PIPE CLASS : **A81K**
RATING : 150
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-40	38	93	149	204
PRESS	19.3	19.3	16.17	14.41	13.35

SERVICE

ALKYL (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 3/4 INCH SIZES MAXIMUM.) (BASED ON LICENSOR PMS CLASS - 7C28)

NOTES

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.3.5 AND ASTM A 370.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

342 FOR ALL SOCKET WELDED BALL VALVE, ON INSTALLATION, REMOVE ALL BOLTS EXCEPT ONE AND ROTATE CENTER SECTION OF VALVE OUT OF LINE DURING SOCKET WELDING. BE CAREFUL TO AVOID DAMAGE TO OR LOSS OF PARTS.

345 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE THREAD DOPE WHERE SEAL WELDING AND COVER ALL EXPOSED THREADS WITH WELD.

377 LICENSOR REFERENCE [PPF-2] FOR REQUIREMENTS FOR PIPING IN LOW TEMPERATURE SERVICE.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

528 DUAL STAMP SHALL BE REQUIRED FOR ALL MATERIALS WHERE 2 GRADES OF MATERIAL ARE REQUIRED.

586 THREE PIECE BODY AND OVAL HANDWHEEL OPERATED BALL VALVE ; USE ONLY ON P&ID NOTE.

590 DURING DESIGN ENGINEERING, ALL PROPOSED FLANGED JOINTS MUST BE EVALUATED FOR NEED. FLANGED JOINTS MUST NOT BE UTILIZED FOR EASE OF INSTALLATION SINCE THEY ARE SUBJECT TO EMISSIONS MONITORING.

627 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 7C28

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

638 REFER LICENSOR SPECIFICATION FOR STR-351 FOR STRAINERS.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

977 TO BE USED IN DC, TT AND OTHER CHLORINATED HYDROCARBON SERVICE

978 NOT TO BE USED FOR DC, TT OR OTHER CHLORINATED HYDROCARBON SERVICE

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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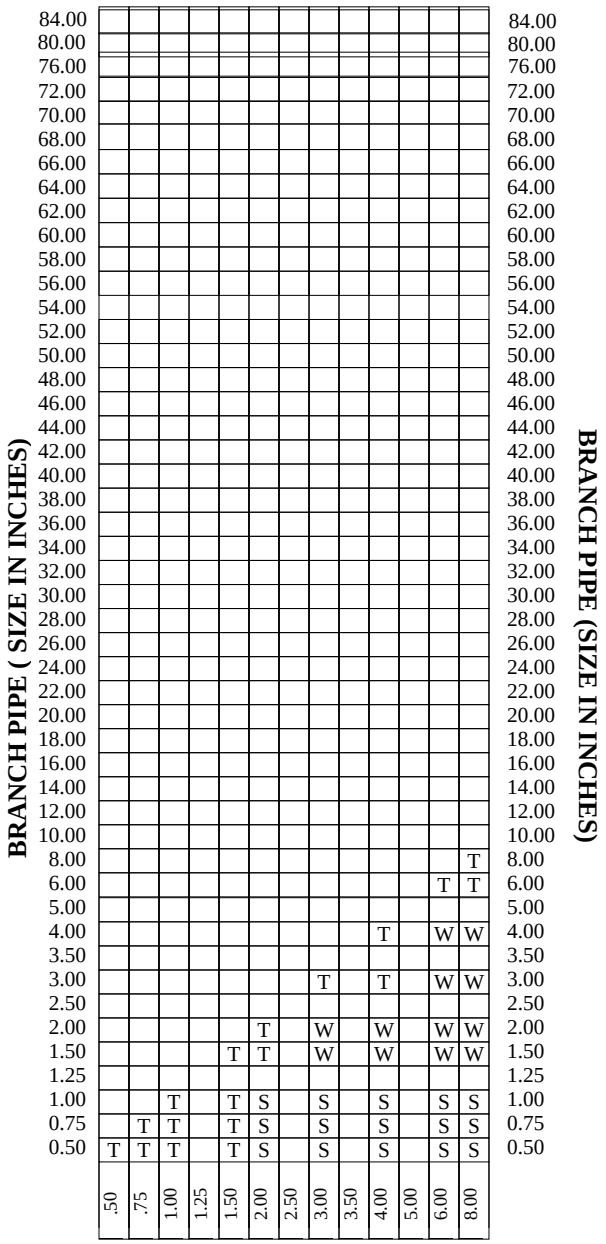
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINANCE JOINTS	ALL	WELDED AND FLANGED. FLANGED JOINTS MUST BE MINIMIZED IN ORDER TO MAINTAIN LOW FUGITIVE EMISSIONS REQ	
PIPE JOINTS	1.0" & BELOW	SWCOUPLING	
	1.5" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350,DP3	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0351,D3	
VENTS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350,VP3	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0351,V3	
TEMP. CONN.		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS. CONN.	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A81K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z5	
PIP	PIPE	1.5	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z5	
PIP	PIPE	2	3	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z5	
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z5	
Flange Group									
FLG	FLNG.SW	.5	1	M	B-16.5	ASTM A 182 GR.F316/316L	150, RF/125AARH	FSCD927Z5	
FLG	FLNG.LJ	1.5	3		B-16.5	ASTM A 350 GR.LF2 CL.1	150, STK/MAX1000AARH	FLCD72EZ5	
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 182 GR.F316/316L	150, RF/125AARH	FBCD927Z5	
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 182 GR.F316/316L	150, FF/125AARH	FGKD921Z5	
Fitting Group									
ELB90	ELBOW.90	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z5	
ELB90	ELBOW.90	1.5	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z15	
ELB45	ELBOW.45	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z5	
ELB45	ELBOW.45	1.5	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z15	
TEQ	T.EQUAL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z5	
TEQ	T.EQUAL	1.5	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ5	
TRED	T.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z5	
TRED	T.RED	1.5	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ5	
REDC	REDUC.CONC	.75	1.5	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ5	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ5	
REDE	REDUC.ECC	.75	1.5	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ5	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ5	

Package : IPMCS
Report No. : 50

A81K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	.5	1		B-16.11	ASTM A182 GR.F304/304L	SCRF, 6000	WF6U683Z5	422
CAP	CAP	1.5	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ5	
PLG	PLUG	.25	1		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z5	307
CPLF	CPLNG.FULL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z5	
CPLH	CPLNG.HALF	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z5	
CPLL	CPLNG.LH	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z5	
CPLR	CPLNG.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z5	
STB	STUB.END	1.5	3	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, STOCK	WSGU745Z5	
O'let Group									
SLT	SOCKOLET	.5	1		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z5	
WLT	WELDOLET	1.5	3	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ5	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YESU64ZZ5	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YLSU64ZZ5	311
Valves Group									
CHV	VLV.CHECK	.5	3		MNF'STD	BODY-ASTM A 351 GR.CF8M,TRIM-SS316;DISK SEAT-TEFLON O-RING	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 533LP	533LPZZZ5	627
CHV/1	VLV.CHECK	.5	.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 530MP	530MPZZZ5	627
BLV	VLV.BALL	.5	6		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,BALL + STEM-SS 316;SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543LP	543LPZZZ5	627,978
BLV/5	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540CP	540CPZZZ5	977,627, 312
BLV/4	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT-RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540BP	540BPZZZ5	977,627

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A81K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV/3	VLV.BALL	1.5	3		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316 SEAT : RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543BP	543BPZZZ5	977,627
BLV/2	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,BALL+STEM- SS316; SEATS- RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540LP	540LPZZZ5	586,627, 978
BLV/1	VLV.BALL	.5	.75		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,BALL+STEM- SS316 ; SEAT- RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540MP	540MPZZZ5	312,627, 978
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A320 GR.L7 (HDG), NUT:A194 GR.7 (HDG)		BS44231Z5	
Gasket Group									
GAS	GASKET	.5	3		B-16.20-ANSI B16.5	SS 316+GRAFIL+SS 316 I-RING	SPIRAL, 150	GK6BJ72Z5	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A216GR.WCB;INT:SS304	SW, Y-TYPE, 800	SP380D515	637
PSR	STRNR.PERM	2	3		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 150,RF/125AARH, LGFM/125AARH	SP3805535	638

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A82A** Sheet 1 of 5

PIPE CLASS : **A82A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	165
PRESS	20.03	20.03	18.28	16.17	14.06

SERVICE

SOLIDS CONVEYING (BASED ON LICENSOR PMS CLASS - 1C14)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

316 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO WELDING. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLATTER SHALL BE REMOVED. (CONTD.)

317 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL B USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

318 BEND RADIUS IN SOLIDS CONVEYING SERVICE MUST BE 9-TIMES NOMINAL SIZE. COMMERCIAL ELBOW SHALL NOT BE USED. FOR BENDS PIPE MATERIAL IS ALSO ACCEPTABLE.

319 PROVIDE WELDED GROUNDING CLIPS AT FLANGED EQUIPMENT AND ON BOTH SIDES OF FLANGED JOINTS.

320 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION. DO NOT USE IN-LINE FOR CONVEYING.

328 JOINTS INCLUDING EQUIPMENT CONNECTIONS, SHALL BE ELECTRICALLY BONDED AND PIPING GROUNDED.

549 RUN AN ELECTRICAL CONTINUITY TEST EACH TIME THE PIPEWORK IS ASSEMBLED, AND AT LEAST ONCE A YEAR.

611 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1C14.

634 INSTALL PRESSURE GAUGES WITH CHEMICAL ATTACHMENT WITH 1/2" NPT MALE CONNECTION AND FILLED WITH UNINHIBITED SILICONE FLUID.

664 PTFE FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A82A** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SCREWED COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A82A** Sheet 3 of 5

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	
84.00									84.00
80.00									80.00
76.00									76.00
72.00									72.00
70.00									70.00
68.00									68.00
66.00									66.00
64.00									64.00
62.00									62.00
60.00									60.00
58.00									58.00
56.00									56.00
54.00									54.00
52.00									52.00
50.00									50.00
48.00									48.00
46.00									46.00
44.00									44.00
42.00									42.00
40.00									40.00
38.00									38.00
36.00									36.00
34.00									34.00
32.00									32.00
30.00									30.00
28.00									28.00
26.00									26.00
24.00									24.00
22.00									22.00
20.00									20.00
18.00									18.00
16.00									16.00
14.00									14.00
12.00									12.00
10.00									10.00
8.00									8.00
6.00									6.00
5.00									5.00
4.00									4.00
3.50									3.50
3.00								T	3.00
2.50									2.50
2.00						T		P	2.00
1.50					T	T		P	1.50
1.25									1.25
1.00			T		T	P		P	1.00
0.75		T	T		T	J		J	0.75
0.50	T	T	T		T	J		J	0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A82A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A82A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S80	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	2	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP/	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	TOE, SEAMLESS	PN219G7Z0	
Flange Group									
FLG	FLNG.WN	.5	3	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
BND	PIPE.BEND	.5	.75	M	ASME B31.3	ASTM A 234 GR.WPB	PE, 9D	WCI6878Z0	318
BND	PIPE.BEND	1	3	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 9D	WCI6848Z0	318
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WE60282Z0	
TEQ	T.EQUAL	1	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WR60282Z0	
TRED	T.RED	1	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	1	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	1	3	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	1	3	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	.75		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WJ60282Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WK60282Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A82A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WL60282Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WM60282Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
TLT	THREADOLET	.5	.75		MSS-SP97	ASTM A 105	SCRF, 3000	YTS0282Z0	
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
BLV	VLV.BALL	.5	.75		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS316;SEAT-RPTFE	SCRF, 800, 3000, B-1.20.1, SHT NO.-540NB	540NBZZZ0	320,611
BLV	VLV.BALL	1	3		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,BALL +STEM-SS316, SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543LB	543LBZZZ0	611
Bolt Group									
BOS	BOLT.STUD	.5	4		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	4		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 150	GK1DY72Z0	664

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A83A** Sheet 1 of 5

PIPE CLASS : **A83A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	65	93
PRESS	20.03	20.03	19.17	18.28

SERVICE

SULFURIC ACID (93 ~ 98% CONCENTRATION,
MAX. VELOCITY 0.9 M/S)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

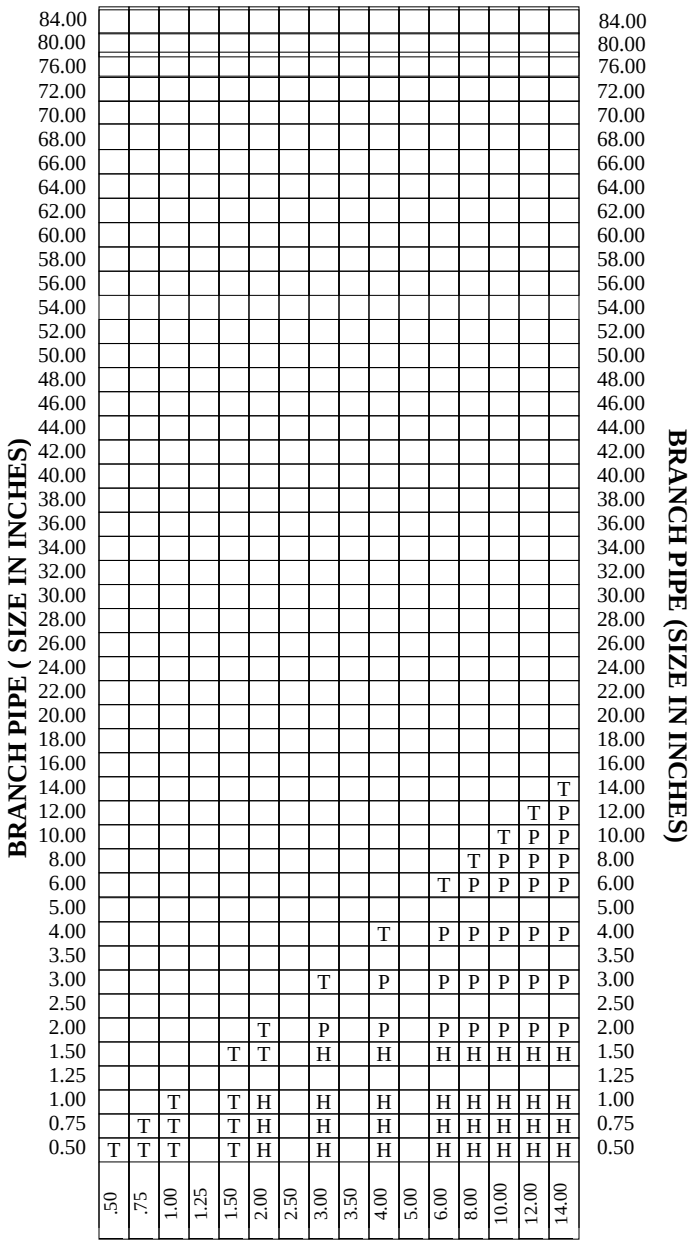
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A83A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A83A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A83A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.WN	2	6	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.5	6		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	6		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A83A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	2	24		API 600/ ISO 10434	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20 & STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CR	513CRZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20 & STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CR	523CRZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20 & STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CR	533CRZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	6		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A83A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	6		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316	SW, Y-TYPE, 800	SP304D510	
PSR	STRNR.PERM	2	6	M	EIL'STD	B:A234GR.WPB;INT:SS316	BW, T-TYPE	SP13444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 1 of 7

PIPE CLASS : **A88A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE

CYCLIC PRESSURE;HYDROCARBONS (BASED ON LICENSOR PMS CLASS - 1C11)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

308 ALL PRESSURE RESISTING BUTT WELDS SHALL BE 100% RADIOGRAPHED AS PER B31.3. ALL OTHER WELDS SHALL BE LP/MP EXAMINED AS PER B31.3. WHEN SPECIFICALLY APPROVED ULTRASONIC EXAMINATION MAY BE SUBSTITUTED FOR RADIOGRAPHIC, LP/MP EXAMINATION.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

314 USE "HOERBIGER" "DEPEND A CHECK" TYPE CHECK VAVE FOR PULSATING FLOW.

329 USE FOR ONLY 3/4"X1/2" SCRD GLOBE VALVE (GLV/1) TO BE USED FOR VENTS, DRAINS AND INSTRUMENT CONNECTION.

356 AT THREADED EQUIPMENT CONNECTIONS ONLY. SEAL WELD SHALL COVER ALL THREADS.

357 BRANCH CONNECTION SHALL BE LOCATED AT POINTS WHERE THE RUN LINE IS ANCHORED.

538 FOR PISTON TYPE CHECK VALVE

547 LINES SHALL BE RESTRAINED BY USE OF RIGID ANCHORS AND FRICTION PIPE SLIDES (STAUFF CORP. OR EQUAL).

548 SEPARABLE SOCKETS SHALL BE SOCKET WELD TYPE.

576 USE FOR ONLY 3/4" X 1/2" SW GLOBE VALVE (GLV/3) TO BE USED FOR VENT, DRAINS AND INSTRUMENT CONNECTION.

584 ONE END (INLET) SW AND OTHER END (OUTLET) SCREWED

610 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1C11

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

638 REFER LICENSOR SPECIFICATION FOR STR-351 FOR STRAINERS.

663 GRAFOIL GTB OR GTK FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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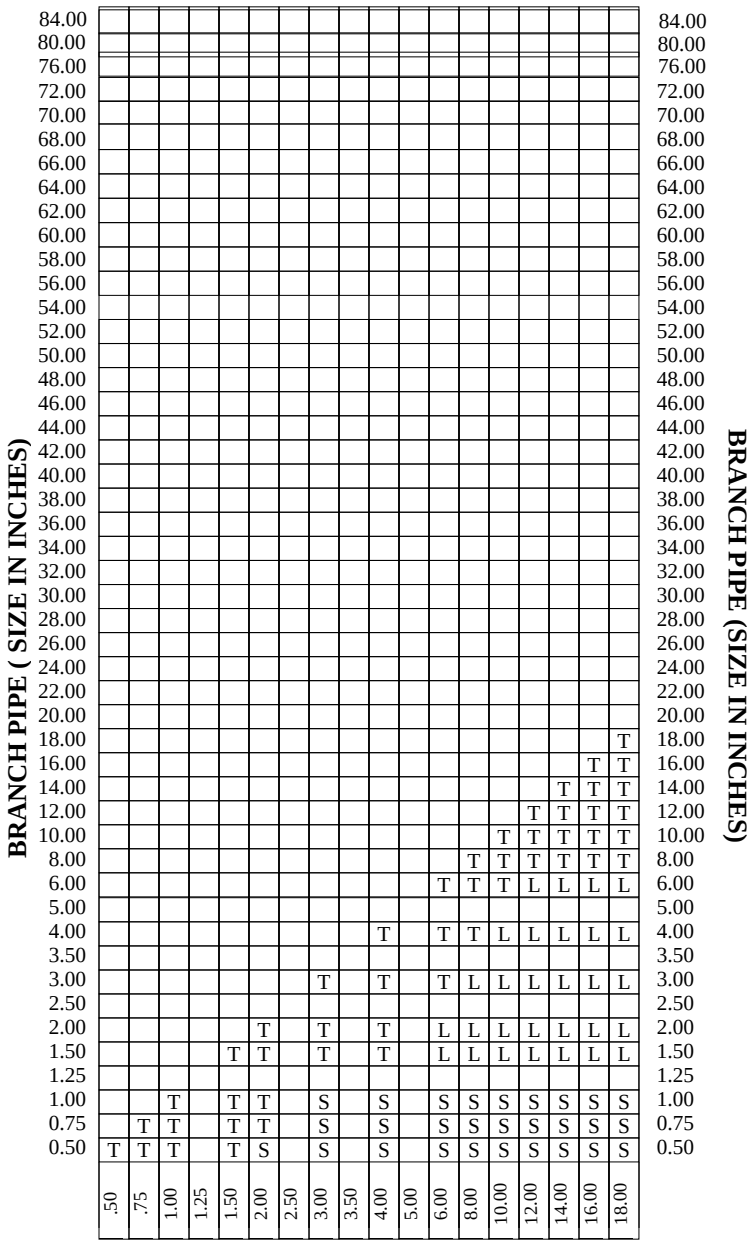
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SW COUPLING	
	1.5" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER STD. 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE. REFER STD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE. REFER STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SCRD GLOBE VALVE TO SPEC AS PER STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A88A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1.5	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP/	NIPPLE	.75	1.5	M	B-36.10	ASTM A 106 GR.B	TOE, SEAMLESS	PN219G7Z0	356
Flange Group									
FLG	FLNG.WN	.75	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLB	FLNG.BLIND	.75	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	1.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	1.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	1.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	16	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	.75		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.75	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.75	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	357
SLT	SOCKOLET	1	1		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	357

Package : IPMCS
Report No. : 50

A88A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
PLT	SWEEPOLET	1.5	6	M, M	MSS-SP97	ASTM A 105	BW	YPS024ZZ0	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
TLT	THREADOLET	.5	.75		MSS-SP97	ASTM A 105	SCRF, 6000	YTS0283Z0	329
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
GAV	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510LA	510LAZZZ0	610
GAV	VLV.GATE	1	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513ME	513MEZZZ0	610
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513LA	513LAZZZ0	610
GLV	VLV.GLOBE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520LA	520LAZZZ0	610
GLV	VLV.GLOBE	1	2		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523ME	523MEZZZ0	610
GLV	VLV.GLOBE	3	24		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523LA	523LAZZZ0	610
GLV/3	VLV.GLOBE	.75	.75		BS EN ISO 15761	BODY-ASTM A 105,TRIM -SS316	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 520VC	520VCZZZ0	576,610
GLV/1	VLV.GLOBE	.75	.75		BS EN ISO 15761	BODY-ASTM A 105,TRIM-SS 316	SPCL, 800, 6000, B-16.11, REFER VMS SHT, SHT NO.- 520ME	520MEZZZ0	329,610
CHV	VLV.CHECK	.75	.75		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530LA	530LAZZZ0	538,610
CHV	VLV.CHECK	1	1.5		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533ME	533MEZZZ0	610
CHV	VLV.CHECK	2	18		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533LA	533LAZZZ0	610
Bolt Group									
BOS	BOLT.STUD	.75	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	

Package : IPMCS
Report No. : 50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A88A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.75	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 150	GK66372Z0	663
Trap/Strainer Group									
PSR	STRNR.PERM	.75	1		MNF'STD	B:A216GR.WCB;INT:SS304	SW, Y-TYPE, 800	SP380D510	637
PSR	STRNR.PERM	1.5	10		MNF'STD	B:A351GR.CF8M;INT:SS316	FLGD, Y-TYPE, 150,RF/125AARH, LGFM/125AARH	SP3A15530	638

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A8A** Sheet 1 of 5

PIPE CLASS : **A8A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	65
PRESS	20.03	20.03	19.17

SERVICE

SULPHURIC ACID (80-98% CONC.) - TOXIC BUT NON LETHAL.

NOTES

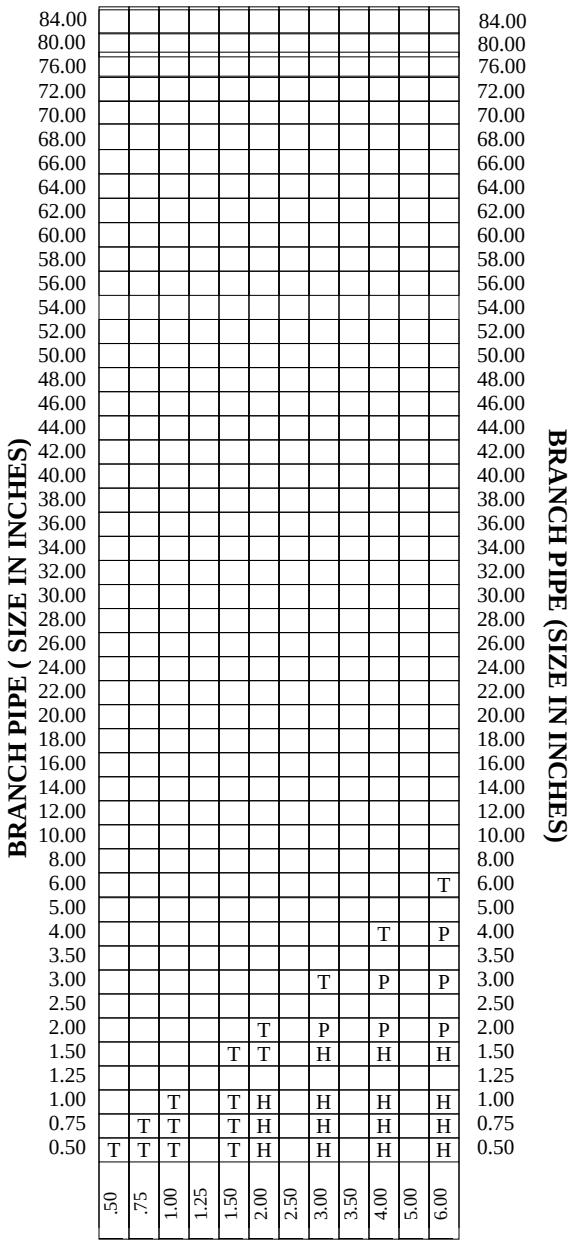
5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A8A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A8A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A8A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	6	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	6	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG/300	FLNG.WN	2	6	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	6		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	6		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A8A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	6	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	6	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51006	51006ZZZ0	
GAV	VLV.GATE	2	6		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51306	51306ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS316	SW, 800, 3000, B-16.11, SHT NO.- 52006	52006ZZZ0	
GLV	VLV.GLOBE	2	6		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52306	52306ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53006	53006ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A8A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	6		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53306	53306ZZZ0	
BLV	VLV.BALL	.5	6		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-PTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54306	54306ZZZ0	
PLV	VLV.PLUG	.5	6		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55306	55306ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	6		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	6		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS/300	GASKET	.5	6		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 300, 2 MM	GKBAX54Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316	SW, Y-TYPE, 800	SP304D510	
PSR	STRNR.PERM	2	6	M	EIL'STD	B:A234GR.WPB;INT:SS316	BW, T-TYPE	SP13444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 1 of 10

PIPE CLASS : **A91A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	10.55	10.55	10.55	10.55

SERVICE

COOLING WATER, RAW WATER, SERVICE WATER (UNDER GROUND) CATEGORY "D"

NOTES

31 USE BUTTERFLY VALVES INSTEAD OF GATE VALVES FROM 10" ONWARDS IN WATER SERVICE AND UPTO 70 DEG C. DESIGN PRESSURE FOR BUTTERFLY VALVES IS LIMITED UPTO 10 BAR.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

76 FOR PERMANENT BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300.

77 FOR SIZES > 24", SPACER & BLIND SHALL BE AS PER EIL'STD 7-44-0164.

86 BUTTERFLY VALVES FOR THE SPEC ARE PN10 RATED WITH A MAXIMUM PRESSURE OF 10.2 KG/CM2G.

107 MITRES MAY BE USED IN CATEGORY 'D' SERVICE ABOVE 14"NB. HOWEVER, USE OF ELBOWS IS PREFERRED UP TO 48" SIZE. MITRES TO BE DESIGNED AS PER ASME B31.3.

140 PIPES SHALL BE EXTERNALLY '3L PE COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION

141 FITTINGS SHALL BE EXTERNALLY 'EPOXY COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION.

146 USE 6 PIECES 90 DEG MITRE FOR SIZE(S) 52, 60, 62, 78, 108; 7 PIECES 90 DEG MITRE FOR SIZE(S) 56, 66, 72, 96, 100, 110, 114, 120, 142, 156; 45 DEG MITRE REQUIRES ONE PIECE LESS.

147 CALCULATION OF PIPE THICKNESSES ARE DONE CONSIDERING MAXIMUM SOIL COVER OF 2500 MM.

148 CALCULATION OF PIPE THICKNESSES ARE DONE CONSIDERING MAXIMUM SOIL COVER OF 1500 MM.

149 CALCULATION OF PIPE THICKNESSES ARE DONE CONSIDERING MAXIMUM SOIL COVER OF 1200 MM.

150 PROVIDE BUOYANCY BLOCK.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

152 MITERS SHALL NOT BE FIELD FABRICATED FOR SIZES 108", 110", 114", 120", 142" & 156", AS THICKNESS OF IS-3589 PIPE CONSIDERED IN THESE SIZES ARE NOT ADEQUATE FOR MITER FABRICATION.

155 GASKET SHALL CONFIRM TO ALL THE TESTING REQUIREMENTS OF BS 7531 AND THICKNESS TOLERANCES SHALL BE AS PER TOLERANCES FOR 2 MM THICKNESS SPECIFIED IN BS 7531 .

156 MINIMUM SOIL COVER FROM TOP OF PIPE SHALL BE 600 MM FOR SIZES UPTO 24", 800 MM FOR SIZES 26" TO 44", 1000 MM FOR SIZES 46", 48" & 52", 1200 MM FOR SIZES 56" AND 1500 MM FOR SIZES 60", 62", 66", 72" & 78".

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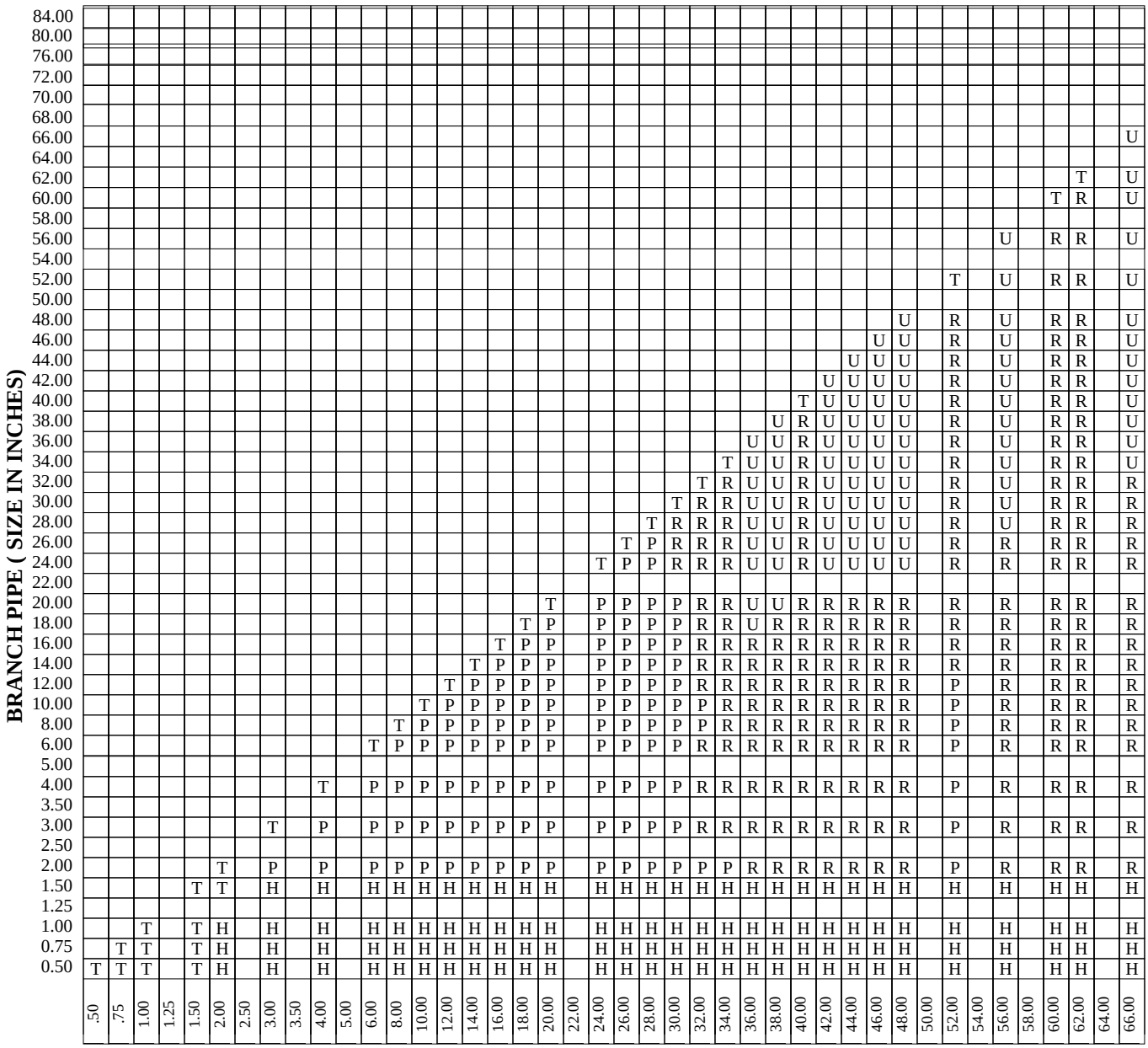
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 2 of 10

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-350, DF3	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD. 7-44-351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VC1	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD 7-44-351, V1	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-353	
PRESS.CONN	0.75"	SW NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 3 of 10



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A91A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 4 of 10

BRANCH PIPE (SIZE IN INCHES)

68.00	70.00	72.00	74.00	76.00	78.00	80.00	82.00	84.00	
									84.00
									80.00
									76.00
		U			U				72.00
									70.00
									68.00
		U			U				66.00
									64.00
		U			U				62.00
		U			U				60.00
									58.00
		U			U				56.00
									54.00
		U			U				52.00
									50.00
		U			U				48.00
		U			U				46.00
		U			U				44.00
		U			U				42.00
		U			U				40.00
		U			R				38.00
		U			R				36.00
		R			R				34.00
		R			R				32.00
		R			R				30.00
		R			R				28.00
		R			R				26.00
		R			R				24.00
									22.00
		R			R				20.00
		R			R				18.00
		R			R				16.00
		R			R				14.00
		R			R				12.00
		R			R				10.00
		R			R				8.00
		R			R				6.00
									5.00
		R			R				4.00
									3.50
		R			R				3.00
									2.50
		R			R				2.00
		H			H				1.50
									1.25
		H			H				1.00
		H			H				0.75
		H			H				0.50

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Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 5 of 10

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	147,156
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	147,156
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	147,156
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	147,156
PIP	PIPE	16	38	10.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	147,156
PIP	PIPE	40	46	12.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	147,156
PIP	PIPE	48	48	12.5	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	147,156
PIP	PIPE	52	52	16.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	147,156
PIP	PIPE	56	56	16.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	147,156
PIP	PIPE	60	60	18.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,156
PIP	PIPE	62	62	18.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,156
PIP	PIPE	66	66	18.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,156
PIP	PIPE	72	72	20.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,156
PIP	PIPE	78	78	22.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,156
PIP	PIPE	96	96	25.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	100	100	26.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	108	108	22.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	110	110	22.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	114	114	22.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	120	120	24.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	148,150
PIP	PIPE	136	136	28.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	150
PIP	PIPE	142	142	28.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	149,150
PIP	PIPE	156	156	30.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	149,150

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 6 of 10

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.SO	2	24		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLG	FLNG.SO	26	144		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLG	FLNG.SO	156	156		JOB'STD	ASTM A 516 GR.70	150, FF/125AARH	FNF6321Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	72		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	
FLB	FLNG.BLIND	74	156		JOB'STD	ASTM A 516 GR.70	150, FF/125AARH	FBF6321Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	144		AWWA C207D/EIL'S TD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	77
FEF	SPCR&BLND	156	156		JOB'STD	ASTM A 516 GR.70	150, FF/125AARH	FCF6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WAGY84Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WAGY94Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WBGY84Z10	
ELB45	ELBOW.45	16	48	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WBGY94Z10	
MIT90	MITRE.90	52	52	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A91A** Sheet 7 of 10

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
MIT90	MITRE.90	56	56	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	60	60	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	62	62	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	66	66	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	72	72	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	78	78	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	96	96	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	100	100	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WDMBF41Z0	146
MIT90	MITRE.90	108	108	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT90	MITRE.90	110	110	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT90	MITRE.90	114	114	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT90	MITRE.90	120	120	25.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT90	MITRE.90	142	142	30.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT90	MITRE.90	156	156	32.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WDMBT41Z0	146,152
MIT45	MITRE.45	52	52	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	56	56	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	60	60	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	62	62	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	66	66	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	72	72	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
MIT45	MITRE.45	78	78	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	96	96	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	100	100	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW, 1.5D	WGMBF41Z0	146
MIT45	MITRE.45	108	108	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
MIT45	MITRE.45	110	110	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
MIT45	MITRE.45	114	114	24.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
MIT45	MITRE.45	120	120	25.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
MIT45	MITRE.45	142	142	30.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
MIT45	MITRE.45	156	156	32.0	JOB'STD	A672 GR.B60 CL.12(EPOXY COATD)	BW, 1.5D	WGMBT41Z0	146,152
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WEGY84ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WEGY94ZZ0	
TEQ	T.EQUAL	50	156	M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW	WEMBF4ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WRGY84ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WRGY94ZZ0	
TRED	T.RED	50	156	M, M	JOB'STD	IS-3589 GR.410 (EPOXY COATED)	BW	WRMBF4ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WUGY84ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WUGY94ZZ0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	50	156	M, M	EIL'STD	IS-3589 GR.410 (EPOXY COATED)	BW	WUKBF4ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WVGY84ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WVGY94ZZ0	
REDE	REDUC.ECC	50	156	M, M	EIL'STD	IS-3589 GR.410 (EPOXY COATED)	BW	WVKBF4ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WFGY84ZZ0	
CAP	CAP	50	156	CALC	ASME-VIII	ASTM A 516 GR.70	BW	WF3BY4ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
UNN	UNION	.5	1.5		BS-3799	ASTM A 105	SW, 3000	WQH02D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52321	52321ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
CHV	VLV.CHECK	26	48		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 53316	53316ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54321	54321ZZZ0	
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56321	56321ZZZ0	
BFV	VLV.BTRFLY	26	48		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 56316	56316ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	156		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS	GASKET	26	144		AWWA-C207 CL.D	NONASBESTOS BS7531 GR X	RING, 150, 3 MM	GK2AX52Z0	155
GAS	GASKET	156	156		JOB'STD	NONASBESTOS BS7531 GR X	RING, 150, 3 MM	GKFAX52Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	6	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	8	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A92K** Sheet 1 of 5

PIPE CLASS : **A92K**
RATING : 150
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	19.33	19.33	16.17	14.41	13.35

SERVICE

LUBE OIL, SEAL OIL, TRUE INHIBITOR DNBP, TBC, AKOH SOLUTION, PHOSPHATE, DMDS INJECTION, DEMINERALIZED WATER(BEYOND CATEGORY 'D').

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

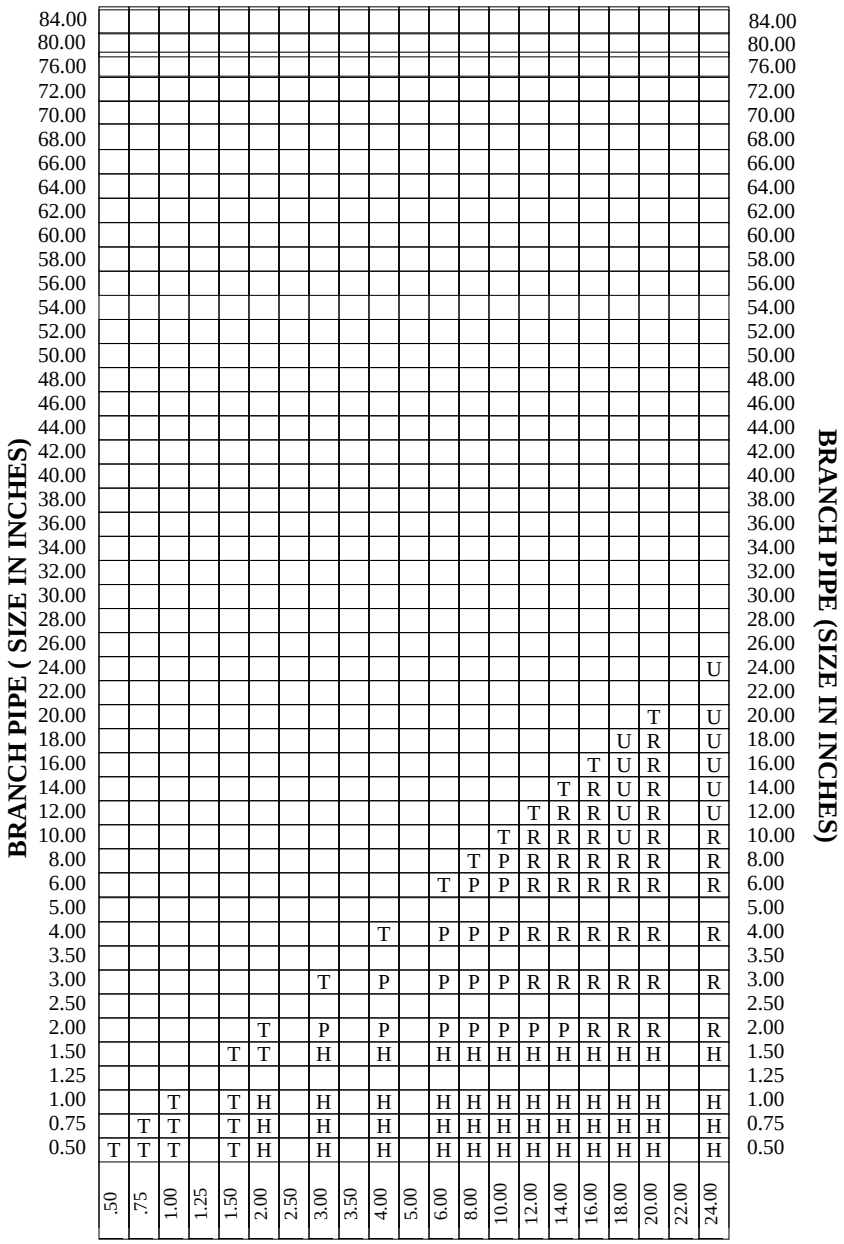
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A92K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A92K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A92K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	24	10S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FWC4127Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	150, RF/125AARH	FBC4127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FGK4121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	150, FF/125AARH	FCK4121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	

Package : IPMCS
Report No. : 50

A92K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A92K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51061	51061ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51361	51361ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52061	52061ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52361	52361ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53061	53061ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A92K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53361	53361ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54361	54361ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 150,FF/125AARH	ST14131Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 1 of 6

PIPE CLASS : **A94A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	18.9	18.9	18.9	18.9

SERVICE

FIRE WATER-FRESH WATER (ABOVE GROUND)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

88 10% OF THE BUTT WELD JOINTS SHALL BE RADIOGRAPHED. HOWEVER, 50% OF THESE BUTT WELD JOINTS SHALL BE FIELD WELD JOINTS.

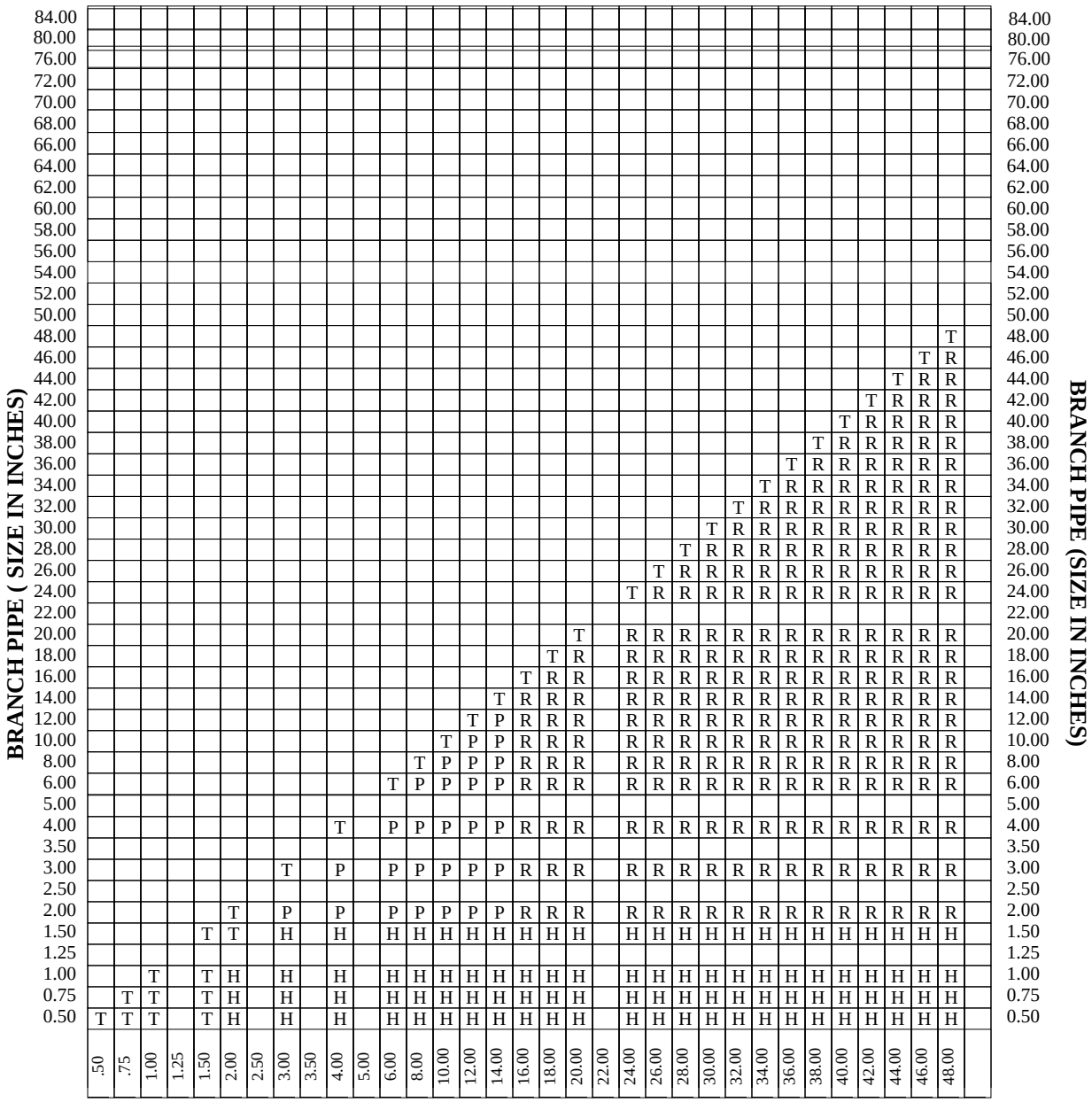
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VC1	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V1	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A94A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	6.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	18	24	8.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	26	30	10.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	32	32	10.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	32
PIP	PIPE	34	38	12.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	40	40	12.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	32
PIP	PIPE	42	46	14.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	48	48	16.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG	FLNG.SO	2	24		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52321	52321ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	

Package : IPMCS
Report No. : 50

A94A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	26	48		B-16.21-ANSI B16.47B	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKAAX52Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	6	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	8	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94M** Sheet 1 of 5

PIPE CLASS : **A94M**
RATING : 150
BASE MATERIAL : SS 316
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	65
PRESS	9	9	9

SERVICE

CONCENTRATE FOAM

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

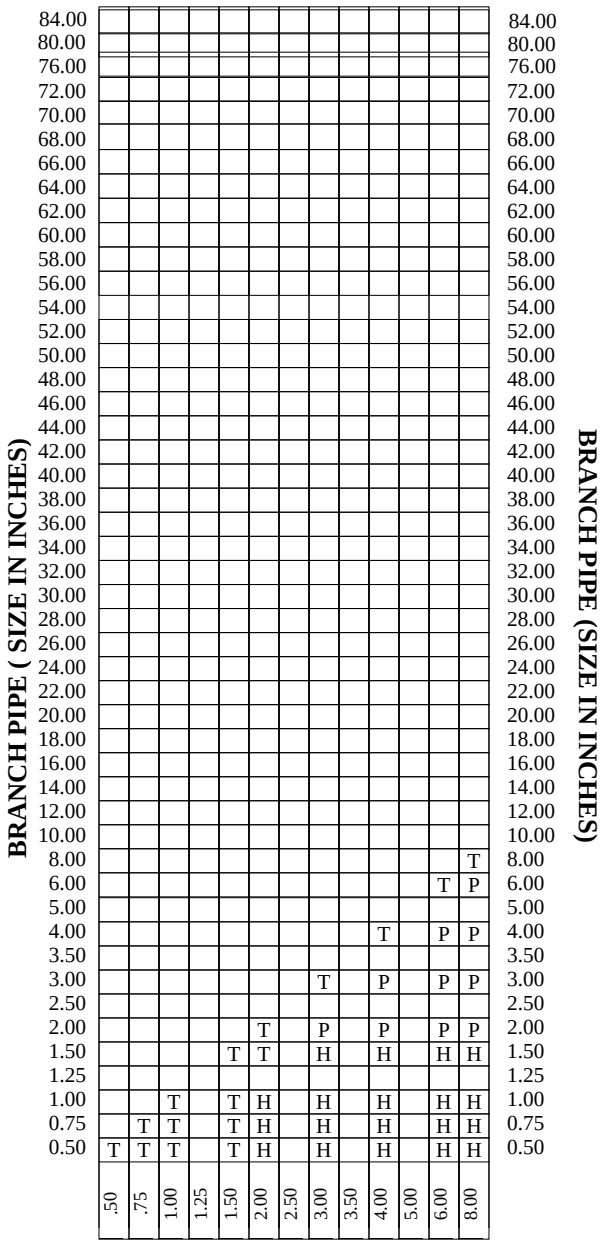
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94M** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A94M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94M** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP316	PE, SEAMLESS	PI33877Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP316	PE, SEAMLESS	PI33877Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP316	BE, SEAMLESS	PI33817Z0	
PIP	PIPE	3	8	10S	B-36.19	ASTM A 312 TP316	BE, SEAMLESS	PI33817Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP316	PBE, SEAMLESS	PN33867Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP316	PBE, SEAMLESS	PN33867Z0	
Flange Group									
FLG	FLNG.WN	.5	8	M	B-16.5	ASTM A 182 GR.F316	150, RF/125AARH	FWC4427Z0	
FLB	FLNG.BLIND	.5	8		B-16.5	ASTM A 182 GR.F316	150, RF/125AARH	FBC4427Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316	150, FF/125AARH	FGK4421Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WA645D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP316-S	BW, 1.5D	WAG964Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WB645D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP316-S	BW, 1.5D	WBG964Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WE645D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP316-S	BW	WEG964ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WR645D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP316-S	BW	WRG964ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP316-S	BW	WUG964ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP316-S	BW	WVG964ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F316	PBE	WNH456ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F316	PBE	WPH456ZZ0	
CAP	CAP	2	8	M	B-16.9	ASTM A 403 GR.WP316-S	BW	WFG964ZZ0	

Package : IPMCS
Report No. : 50

A94M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94M** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WJ645D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WK645D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WL645D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F316	SW, 3000	WM645D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.-510CN	510CNZZZ0	
GAV	VLV.GATE	2	8		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513CN	513CNZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.-520CN	520CNZZZ0	
GLV	VLV.GLOBE	2	8		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523CN	523CNZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.-530CN	530CNZZZ0	
CHV	VLV.CHECK	2	8		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS316	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533CN	533CNZZZ0	
BLV	VLV.BALL	.5	8		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 543CN	543CNZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	8		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	8		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	8		EIL'STD	B:A240TP316;INT:SS316	CONETYPE, 150,FF/125AARH, FF/125AARH	ST14231Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A94M** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F316;INT:SS316	SW, Y-TYPE, 800	SP308D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403WP316-S;INT:SS316	BW, T-TYPE	SP15744Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 1 of 6

PIPE CLASS : **A95A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	1.03	1.03	1.03	1.03

SERVICE

CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

77 FOR SIZES > 24", SPACER & BLIND SHALL BE AS PER EIL'STD 7-44-0164.

112 MITERS ARE ALSO ACCEPTABLE IN PLACE OF ELBOWS FOR SIZES 8" TO 36".

140 PIPES SHALL BE EXTERNALLY '3L PE COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION

141 FITTINGS SHALL BE EXTERNALLY 'EPOXY COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

155 GASKET SHALL CONFIRM TO ALL THE TESTING REQUIREMENTS OF BS 7531 AND THICKNESS TOLERANCES SHALL BE AS PER TOLERANCES FOR 2 MM THICKNESS SPECIFIED IN BS 7531 .

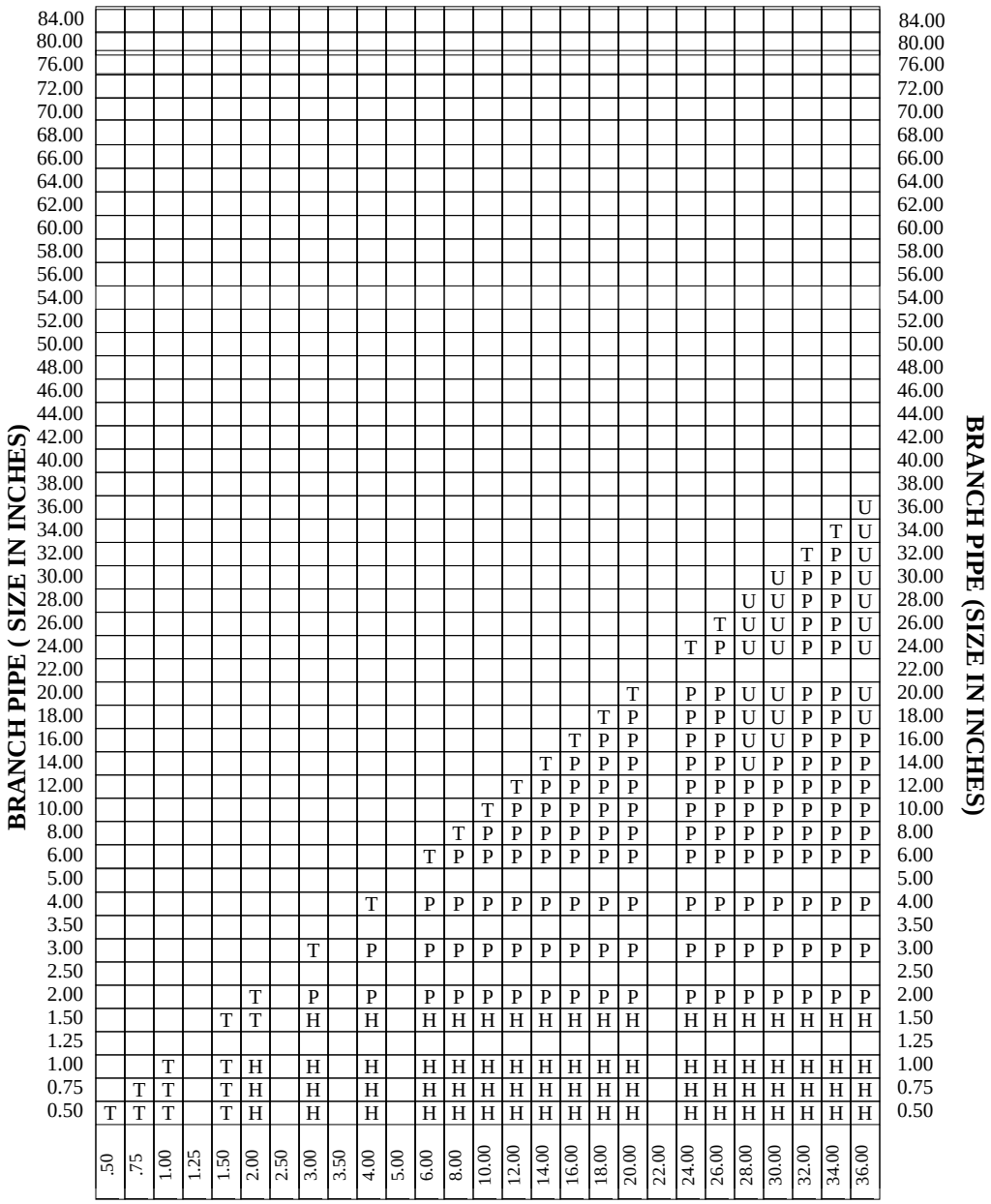
157 MINIMUM SOIL COVER FROM TOP OF PIPE SHALL BE 600 MM FOR SIZES UPTO 24" AND 800 MM FOR SIZES 26" TO 36".

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A95A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
PIP	PIPE	16	20	6.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
PIP	PIPE	22	30	8.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
PIP	PIPE	32	36	10.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.SO	2	24		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLG	FLNG.SO	26	36		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	36		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	36		AWWA C207D/EIL'S TD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	77
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WAGY84Z10	112
ELB90	ELBOW.90	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WAGY94Z10	112
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WBGY84Z10	112
ELB45	ELBOW.45	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WBGY94Z10	112
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WEGY84ZZ0	
TEQ	T.EQUAL	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WEGY94ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WRGY84ZZ0	
TRED	T.RED	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WRGY94ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WUGY84ZZ0	
REDC	REDUC.CONC	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WUGY94ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WVGY84ZZ0	
REDE	REDUC.ECC	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WVGY94ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	36	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WFGY84ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GAV	VLV.GATE	26	48		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-HARDFACED	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 513BA	513BAZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52321	52321ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.- 56321	56321ZZZ0	
BFV	VLV.BTRFLY	26	48		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 56316	56316ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	36		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A95A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	26	36		AWWA-C207 CL.D	NONASBESTOS BS7531 GR X	RING, 150, 3 MM	GK2AX52Z0	155

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A96A** Sheet 1 of 5

PIPE CLASS : **A96A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	10.55	10.55	10.55	10.55

SERVICE

CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

76 FOR PERMANENT BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300.

140 PIPES SHALL BE EXTERNALLY '3L PE COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION

141 FITTINGS SHALL BE EXTERNALLY 'EPOXY COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

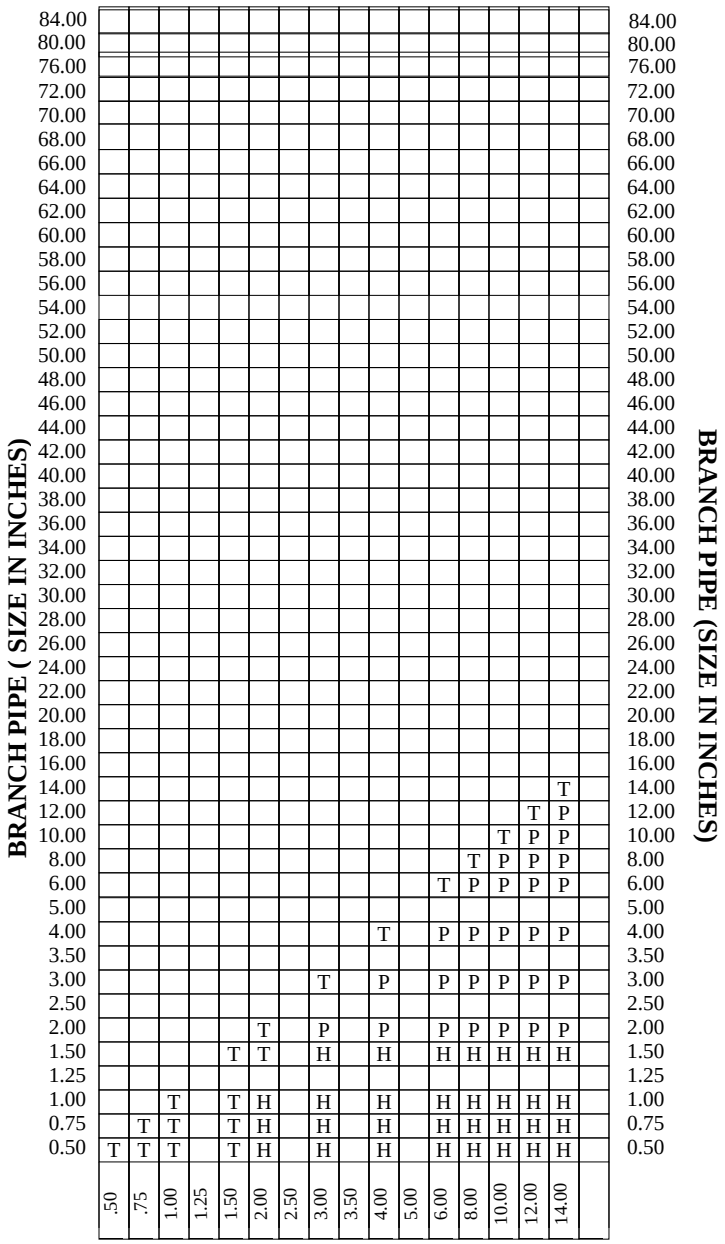
157 MINIMUM SOIL COVER FROM TOP OF PIPE SHALL BE 600 MM FOR SIZES UPTO 24" AND 800 MM FOR SIZES 26" TO 36".

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING, 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER JOB STD A545-7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH GLOBE VALVE TO SPEC AS PER JOB STD A545-7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A96A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A96A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A96A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.SO	2	14		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW, 1.5D	WAGBM4Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW, 1.5D	WBGBM4Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW	WEGBM4ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A96A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW	WRGBM4ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW	WUGBM4ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW	WVGBM4ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	14	M	B-16.9	A 234 GR WPB(EXT:EPOXY CTD)	BW	WFGBM4ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-	FLGD, 150, B-16.5, RF/125AARH, SHT	52321ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A96A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						13%CR.STEEL, SEATS-STELLITED	NO.- 52321		
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH, FF/125AARH	ST16831Z0	5
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	5

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A97A** Sheet 1 of 5

PIPE CLASS : **A97A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	18.9	18.9	18.9	18.9

SERVICE

FIRE WATER- FRESH WATER (UNDER GROUND)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

140 PIPES SHALL BE EXTERNALLY '3L PE COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION

141 FITTINGS SHALL BE EXTERNALLY 'EPOXY COATED' FOR U/G SERVICE ONLY AS PER JOB SPECIFICATION.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

157 MINIMUM SOIL COVER FROM TOP OF PIPE SHALL BE 600 MM FOR SIZES UPTO 24" AND 800 MM FOR SIZES 26" TO 36".

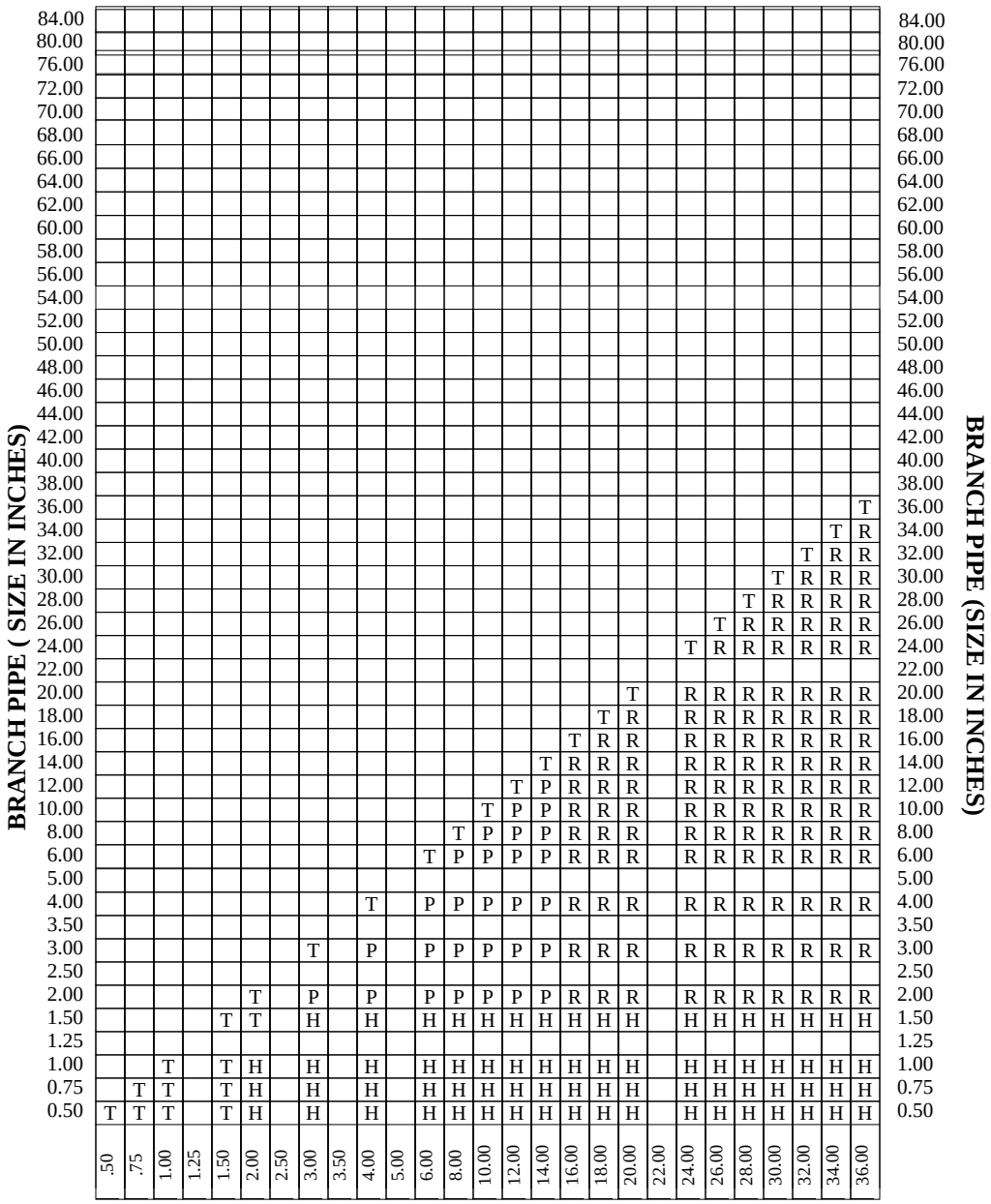
192 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH B-16.34 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A97A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A97A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A97A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	157
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B (PE COATED)	BE, SEAMLESS	PI2R417Z0	157
PIP	PIPE	16	16	6.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
PIP	PIPE	18	20	8.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
PIP	PIPE	24	30	10.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
PIP	PIPE	32	36	12.0	IS-3589	IS-3589 GR.410 (PE COATED)	BE, SAW	PI7V616Z0	157
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG	FLNG.WN	26	36	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG	FLNG.SO	2	24		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	36		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	36		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	5
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WAGY84Z10	
ELB90	ELBOW.90	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WAGY94Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	

Package : IPMCS
Report No. : 50

A97A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A97A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW, 1.5D	WBGY84Z10	
ELB45	ELBOW.45	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW, 1.5D	WBGY94Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WEGY84ZZ0	
TEQ	T.EQUAL	16	36	M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WEGY94ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WRGY84ZZ0	
TRED	T.RED	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WRGY94ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WUGY84ZZ0	
REDC	REDUC.CONC	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WUGY94ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WVGY84ZZ0	
REDE	REDUC.ECC	16	36	M, M	B-16.9	A 234 GR.WPB-W (EPOXY COATED)	BW	WVGY94ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	36	M	B-16.9	A 234 GR.WPB (EPOXY COATED)	BW	WFGY84ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A97A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51321	51321ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52321	52321ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53321	53321ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	36		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS	GASKET	26	36		B-16.21-ANSI B16.47B	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKAAX52Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A99A** Sheet 1 of 4

PIPE CLASS : **A99A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	60	93	149
PRESS	20.03	20.03	19.33	18.28	16.17

SERVICE

CAUSTIC SERVICE, SODIUM HYDROXIDE, HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 30 WT% AT MAX. TEMPERATURE 60 DEG. C, 40 WT% AT MAX. TEMPERATURE 50 DEG.C, AND 50 WT% AT MAX. TEMPERATURE 45 DEG.C), CAUSTIC BLOWDOWN.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

42 ALL WELDS SHALL BE STRESS RELIEVED.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

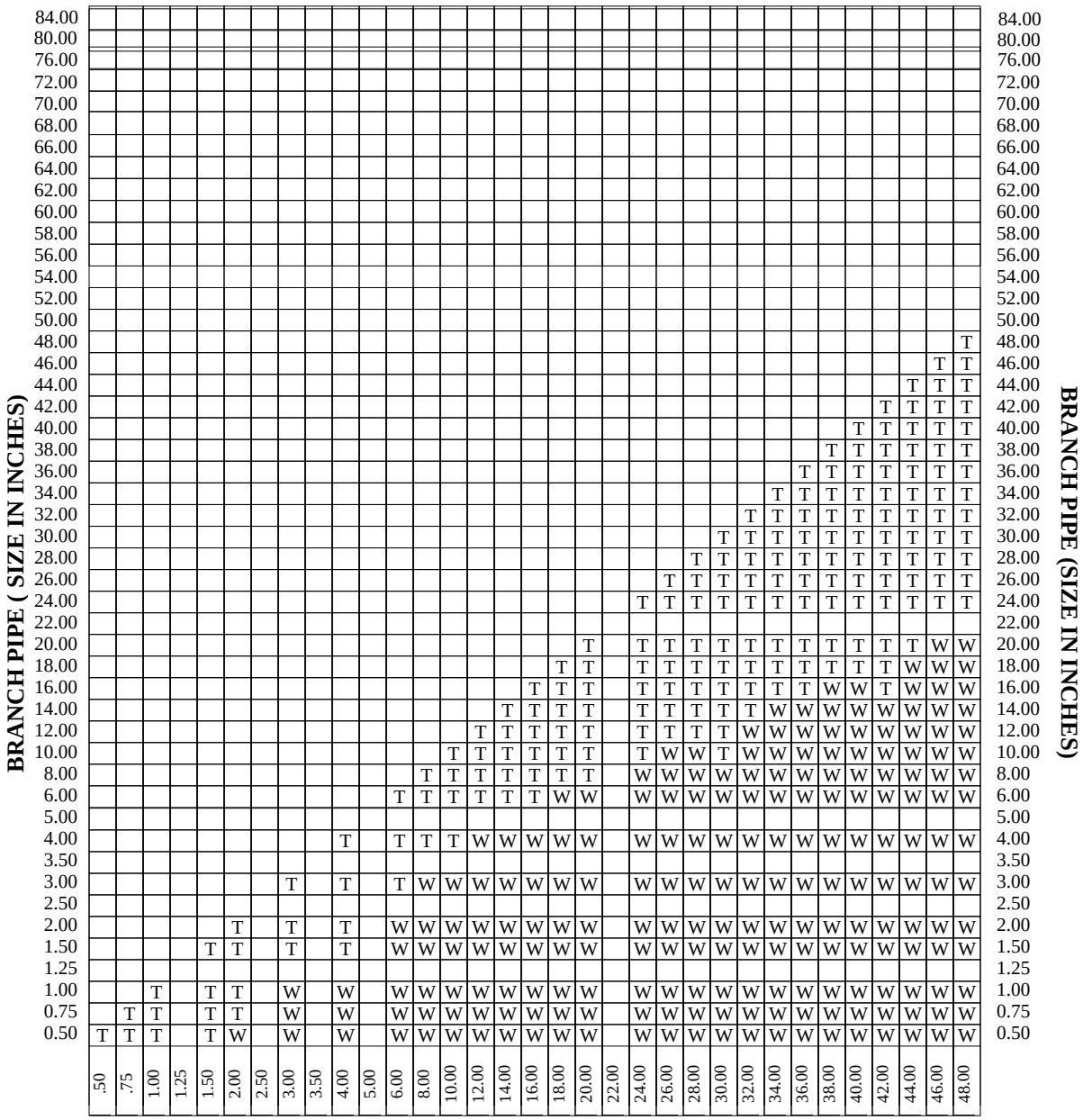
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A99A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A99A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A99A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	26	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
PIP	PIPE	30	30	STD	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
PIP	PIPE	32	36	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
PIP	PIPE	38	44	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
PIP	PIPE	46	46	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
PIP	PIPE	48	48	14.0	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	
FLG	FLNG.WN	26	48	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	48		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	48		ASME B16.47B/EIL' STD	ASTM A 516 GR.70(NORMALISED)	150, FF/125AARH	FCU8921Z0	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	

Package : IPMCS
Report No. : 50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A99A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
CAP	CAP	.5	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
O'let Group									
WLT	WELDOLET	.5	20	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.5	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-MONEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 513DA	513DAZZZ0	
GLV	VLV.GLOBE	.5	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-MONEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 523DA	523DAZZZ0	
CHV	VLV.CHECK	.5	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-MONEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 533DA	533DAZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	26	48		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 1 of 8

PIPE CLASS : **A9A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE / NON FLAMMABLE & NON LETHAL - HVGO,VGO,RCO,SLOP,VR,VGO,CAUSTIC (NO STRESS RELIEF ZONE), BENZENE, CGC AREA CBD, DEBUTANIZER AREA CBD, PGH AREA CBD, QUENCH WATER DRAIN, QUENCH OIL BLOW DOWN, AROMATIC CLOSED DRAIN, CLOSED SOLVENT DRAIN.

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

92 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH B-16.34 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.

115 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [425 DEG. C & 4.2 KG/ CM2 G] SUBJECT TO MINIMUM OF 20 MM THICKNESS.

134 PIPE THICKNESS HAS BEEN CALCULATED ON ACTUAL LINE CONDITION [4.20 KG/CM2 @ 425 DEG.C] SUBJECTED TO MIN. OF 80% OF THE CLASS CONDITIONS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 2 of 8

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00	38.00	40.00	42.00	44.00	46.00	48.00	52.00	56.00	58.00	60.00	62.00	64.00	66.00
84.00																																									
80.00																																									
76.00																																									
72.00																																									
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52.00																																		T		R		R			R
50.00																																									
48.00																																	T	R		R		R			R
46.00																																T	R	R		R		R			R
44.00																															T	R	R	R		R		R			R
42.00																														T	R	R	R	R		R		R			R
40.00																																									
38.00																																									
36.00																											T			R	R	R	R	R		R		R			R
34.00																										T	R			R	R	R	R	R		R		R			R
32.00																									T	R	R			R	R	R	R	R		R		R			R
30.00																								T	R	R	R			R	R	R	R	R		R		R			R
28.00																							T	R	R	R	R			R	R	R	R	R		R		R			R
26.00																						T	R	R	R	R	R			R	R	R	R	R		R		R			R
24.00																					T	R	R	R	R	R	R			R	R	R	R	R		R		R			R
22.00																																									
20.00																			T		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
18.00																		T	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
16.00																	T	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
14.00																T	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
12.00															T	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
10.00														T	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
8.00													T	P	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
6.00												T	P	P	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
5.00																																									
4.00										T		P	P	P	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
3.50																																									
3.00								T		P		P	P	P	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
2.50																																									
2.00						T		P		P		P	P	P	P	P	P	R	R		R	R	R	R	R	R	R			R	R	R	R	R		R		R			R
1.50					T	T		H		H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H			H	H	H	H	H		H		H			H
1.25																																									
1.00			T		T	H		H		H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H			H	H	H	H	H		H		H			H
0.75		T	T		T	H		H		H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H			H	H	H	H	H		H		H			H
0.50	T	T	T		T	H		H		H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H			H	H	H	H	H		H		H			H

RUN PIPE (SIZE IN INCHES)

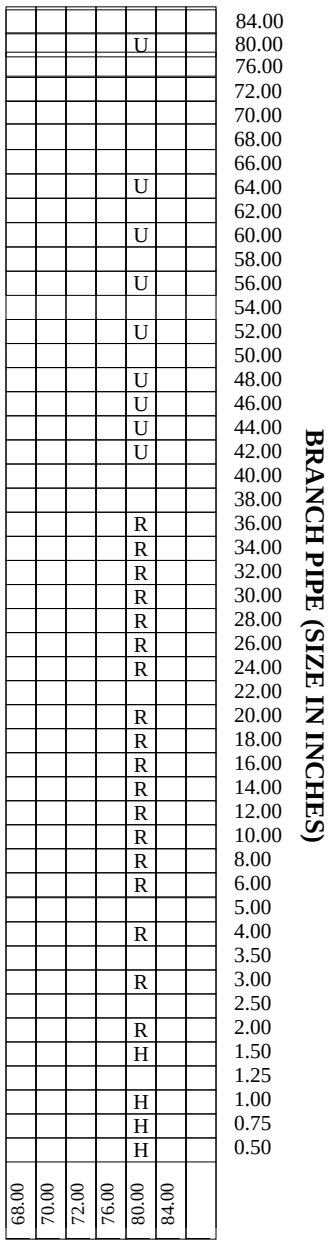
CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

A9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 3 of 8



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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 4 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	26	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	30	30	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	32
PIP	PIPE	32	36	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	42	44	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	46	46	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	32
PIP	PIPE	48	48	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	52	52	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	32
PIP	PIPE	54	56	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	60	60	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	64	64	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	80	80	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	134
PIP	PIPE	88	88	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	134
PIP	PIPE	104	104	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	115
PIP	PIPE	120	120	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	115
PIP	PIPE	124	124	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	115
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG/300	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	150, RF/125AARH	FWC0127Z0	

Package : IPMCS
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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 5 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Flange Group									
FLG	FLNG.WN	26	60	M	B-16.47-B	ASTM A 105	150, RF/125AARH	FWB0127Z0	
FLG/300	FLNG.WN	26	60	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG/300	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26	60		B-16.47-B	ASTM A 105	150, RF/125AARH	FBB0127Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	
FEF	SPCR&BLND	26	60		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	150, FF/125AARH	FCU6321Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	52	124	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WAM754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	52	124	M	JOB'STD	ASTM A 234 GR.WPB-W	BW, 1.5D	WBM754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TEQ	T.EQUAL	52	128	M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WEM754ZZ0	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 6 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
TRED	T.RED	52	128	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WRM754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	52	128	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WUM754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	52	128	M, M	JOB'STD	ASTM A 234 GR.WPB-W	BW	WVM754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	52	128	M	JOB'STD	ASTM A 234 GR.WPB	BW	WFM684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 7 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-13%CR.STEEL			
GAV	VLV.GATE	2	42		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	51301ZZZ0	92
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301	52301ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	53301ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301	54301ZZZ0	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55301	55301ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	60		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK66272Z0	
GAS	GASKET	26	60		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150	GK56272Z0	
GAS/300	GASKET	26	60		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 150,FF/125AARH	ST16831Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :A9A** Sheet 8 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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PIPE CLASS : **B1A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - HYDROCARBONS, AROMATICS, AMMONIA, SWEET GAS, FLUSHING OIL AND OTHER UTILITIES -MP CONDENSATE, INSTRUMENT AIR(OFFSITES), PLANT AIR, NITROGEN, AMMONIA GAS, NITROGEN-HIGH TEMPERATURE ETC. ABOVE CLASS 'A1A'.

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

963 FOR LICENSOR SPECIFICATIONS LGP18 & LGP26 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-366 & FOR 2" TO 10"-STR-354 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

992 FOR LICENSOR SPECIFICATIONS 1C2 IN UNIVATION, FOR SIZE RANGE 0.5" TO 0.75": STR-361, FOR 1" TO 1.5"-STR-366 & FOR 2" TO 12" : STR-351 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

995 FOR LICENSOR SPECIFICATIONS 1E3 & 1E21 IN UNIVATION, FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2" TO 10" : STR-354 IS TO BE FOLLOWED FOR STRAINERS. REFER PPF-8 FOR STRAINER SPECIFICATIONS.

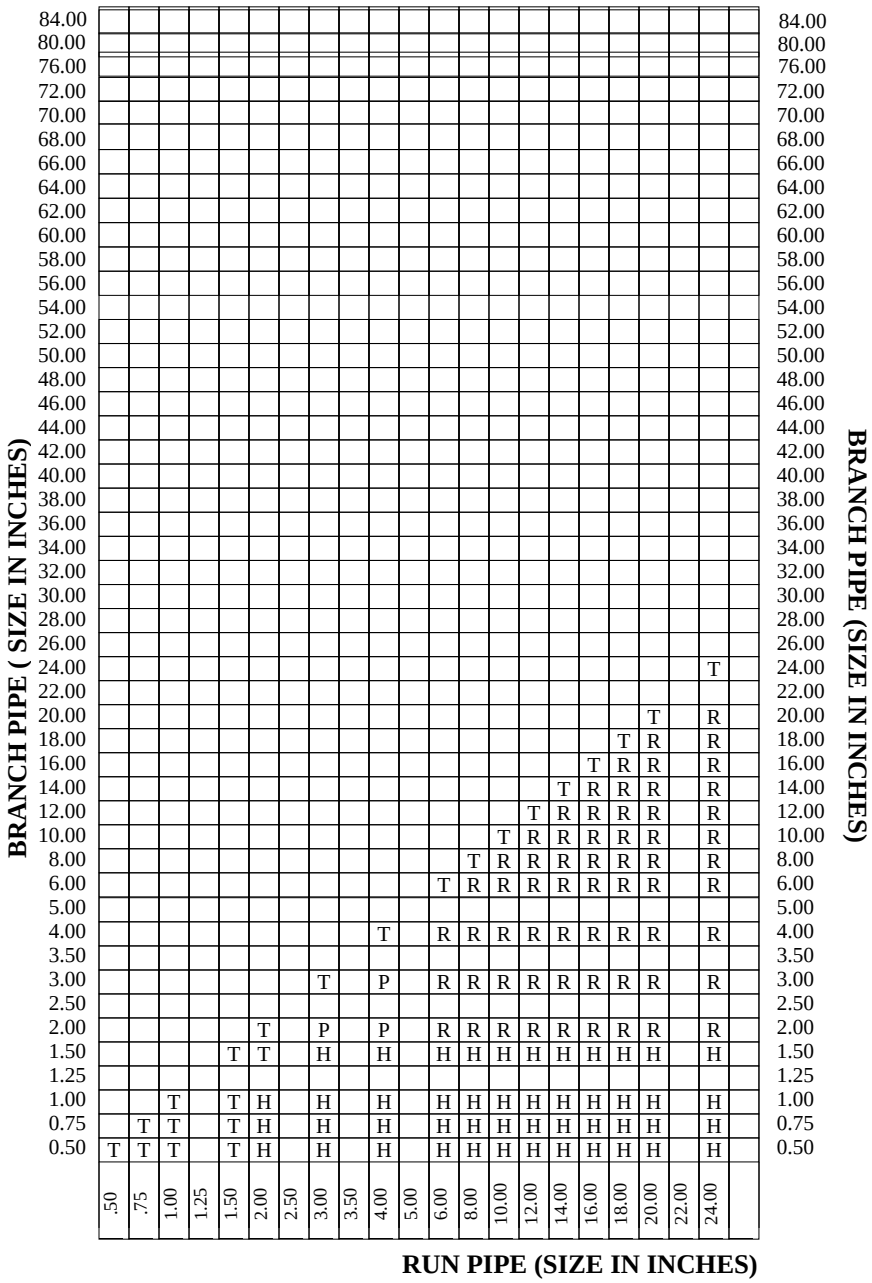
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B1A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	18	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	20	20	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	32
PIP	PIPE	24	24	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	

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Location BINA, MADHYA PRADESH	**Pipe Class :B1A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51401	51401ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52401	52401ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53401	53401ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54401	54401ZZZ0	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 55401	55401ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 300,RF/125AARH	TR30655B0	
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1K** Sheet 1 of 5

PIPE CLASS : **B1K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454
PRESS	50.5	50.5	42.18	37.96	34.8	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE

PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/ NON FLAMMABLE & NON LETHAL HYDROCARBONS, CHEMICAL, LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION ETC.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

51 DESIGN PRESSURE AT -29 DEG.C. AND 38 DEG.C. FOR THIS PRESSURE HAS BEEN REDUCED FROM 50.62 KG/CM2G TO 50.50 KG/CM2G TO OPTIMISE THE THICKNESS FOR 6" SIZE.

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

105 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE HOT DIP GALVANISED A453 GR.660 CL.A

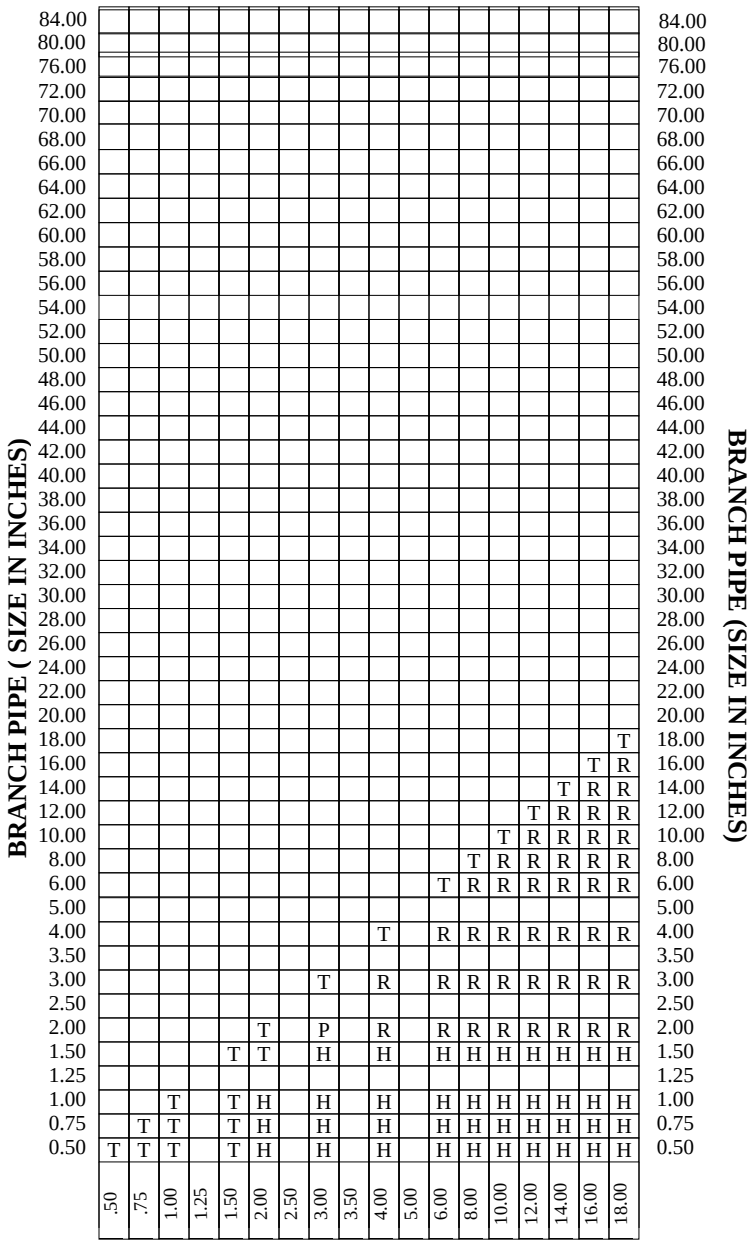
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B1K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	4	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	6	6	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	51
PIP	PIPE	8	8	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	10	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	12	12	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	14	14	7.92	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	16	18	9.53	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	20	24	CALC	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51061	51061ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51461	51461ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B1K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52061	52061ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52461	52461ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53061	53061ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53461	53461ZZZ0	
BLV	VLV.BALL	.5	16		BS-5351	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54461	54461ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(GALV), NUT:A194 2H(GALV)		BS40513Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 300,FF/125AARH	ST14139Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20D** Sheet 1 of 5

PIPE CLASS : **B20D**
RATING : 300
BASE MATERIAL : 1.25 Cr + 0.5Mo
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49
	538	540												
	15.11	14.72												

SERVICE

HP STEAM

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

13 USE NORMALIZED AND TEMPERED MATERIAL ONLY.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

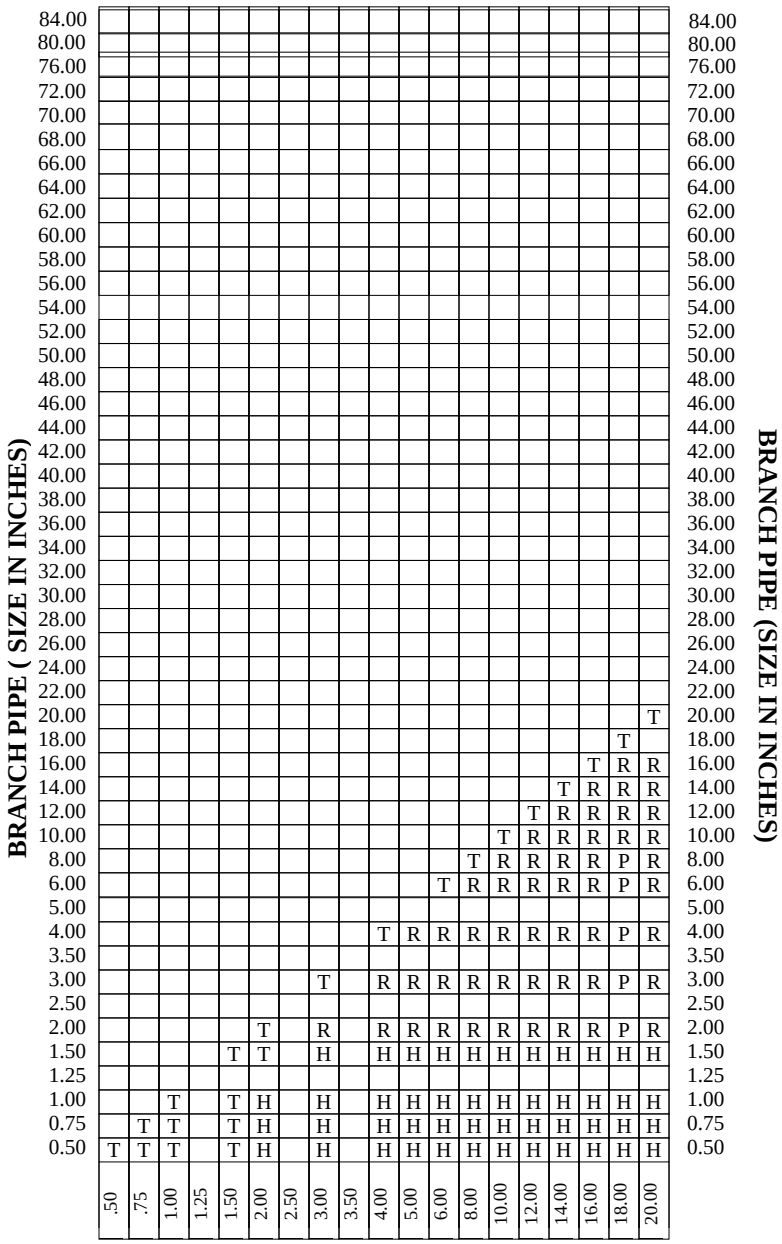
159 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [540 DEG. C & 3.5 KG/ CM2 G] SUBJECT TO MIN. OF 80% OF THE CLASS CONDITIONS.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20D** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B20D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20D** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z1	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z1	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	
PIP	PIPE	4	6	STD	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	32
PIP	PIPE	8	14	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z1	32
PIP	PIPE	18	18	XS	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z1	159
PIP	PIPE	20	20	XS	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z1	32,159
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z1	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z1	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FSC3747Z1	
FLG	FLNG.WN	2	20	M	B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FWC3747Z1	
FLB	FLNG.BLIND	.5	20		B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FBC3747Z1	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F11 CL.2	300, FF/125AARH	FGK3741Z1	
FEF	SPCR&BLND	10	20		ASME-B16.48	ASTM A 182 GR.F11 CL.2	300, FF/125AARH	FCK3741Z1	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WA638D3Z1	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WA638D2Z1	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WAG564Z11	
ELB90	ELBOW.90	16	20	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WAG584Z11	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WB638D3Z1	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WB638D2Z1	

Package : IPMCS
Report No. : 50

B20D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20D** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WBG564Z11	
ELB45	ELBOW.45	16	20	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WBG584Z11	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WE638D3Z1	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WE638D2Z1	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WEG564ZZ1	
TEQ	T.EQUAL	16	20	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WEG584ZZ1	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WR638D3Z1	
TRED	T.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WR638D2Z1	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WRG564ZZ1	
TRED	T.RED	16	20	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WRG584ZZ1	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WUG564ZZ1	
REDC	REDUC.CONC	16	20	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WUG584ZZ1	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WVG564ZZ1	
REDE	REDUC.ECC	16	20	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WVG584ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WNH386ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WPH386ZZ1	
CAP	CAP	2	20	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WFG564ZZ1	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WJ638D3Z1	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WJ638D2Z1	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WK638D3Z1	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WK638D2Z1	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WL638D3Z1	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WL638D2Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20D** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WM638D3Z1	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WM638D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51030	51030ZZZ1	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51430	51430ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52030	52030ZZZ1	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52430	52430ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53030	53030ZZZ1	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53430	53430ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	20		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	20		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F11CL.2; INT:SS304	SW, Y-TYPE, 800	SP310D511	
PSR	STRNR.PERM	2	24		MNF'STD	B:A217GR.WC6;IN T:SS304	FLGD, Y-TYPE, 300,RF/125AARH	SP38255B1	

Package : IPMCS
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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20K** Sheet 1 of 5

PIPE CLASS : **B20K**
RATING : 300
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	50.6	50.6	40.1	26.7

SERVICE

T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP27)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

346 SAFEGUARD AND SUPPORT NPS 0.5" PIPING IN STRUCTURAL CHANNEL MATERIAL.

701 HYDROSTATIC TEST WITH WATER IS NOT PERMITTED. USE MINERAL OIL.

703 NPS 1/2 PIPING IS USED FOR MANY ALKYL LINES SO THE INTERNAL CONTAINED VOLUME IS SMALL. THESE SMALL LINES LACK THE MECHANICAL STRENGTH NECESSARY TO SUPPORT THEMSELVES ACROSS LONG SPANS (AS IN A PIPE RACK) OR TO PROVIDE PROTECTION FROM MECHANICAL DAMAGE FROM IMPACT.

704 (CONTINUED FROM NOTE 703) LONG RUNS IN THE PIPE RACKS AND PIPING THAT ARE POTENTIALLY EXPOSED TO MECHANICAL IMPACT NEED TO BE PROTECTED BY STEEL CHANNEL WITH A STRENGTH EQUAL OR GREATER THAN 4 INCH WIDTH AND WEIGHT PER FOOT OF NO LESS THAN 7.4.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

708 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING, AND COVER ALL EXPOSED THREADS WITH WELD.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

714 FOR PRESSURE GUAGE ASSEMBLY: FOR ALKYL SERVICE, CHEMICAL ATTACHMENTS ARE TO BE USED. DIAPHRAGM IS TO BE CONSTRUCTED OF 304 STAINLESS STEEL AND WELDED TO THE TOP HOUSING. FLUSH CONNECTION IS TO BE PROVIDED. REFER TO TYPICAL SKETCH NUMBER 26 IN THE SUPPLEMENT TO PROCESS PARTS.

715 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC. WELDED VALVES ARE PREFERRED TO MINIMIZE THE NUMBER OF POTENTIAL LEAK POINTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

722 BALL VLV, B16.34; 1000 PSI; SW; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

727 BALL VLV, ASME B16.34; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7, 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

729 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B20K** Sheet 2 of 5

PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2": STR-354 IS TO BE FOLLOWED

730 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

829 CAST; XS;WAFER INSERT TYPE; PTFE SEAT;SS316 SPRING; REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG; CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150/ CLASS 300/ CLASS 600 FLANGES;TO BE USED WITH XS OR THINNER WALL PIPE

830 ASME B16.34/16.10 SHORT PATTERN; CAST; REDUCED PORT TYPE; END ENTRY; SS316 STEM; SEATING: MOLECULARLY ENHANCED PTFE; SS316 BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL

831 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A

911 LICENSOR PMS LGP27 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

990 RECOMMENDED BALL VALVE MANUFACTURES FOR USE IN T2(TEAL) SERVICE SHALL BE AS PER LICENSOR SPECIFICATION LSTD-3 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-911	
	ON LINES >= 2.0"	NOTE-911	
VENTS	ON LINES <= 1.5"	NOTE-911	
	ON LINES >= 2.0"	NOTE-911	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-911)	
PRESS.CONN	0.75"	NOTE-911	

Package : **IPMCS**

Report No. : **50**

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20K** Sheet 3 of 5

BRANCH PIPE (SIZE IN INCHES)

BRANCH PIPE (SIZE IN INCHES)	.50	.75	1.00	1.25	1.50	2.00	2.50
84.00							
80.00							
76.00							
72.00							
70.00							
68.00							
66.00							
64.00							
62.00							
60.00							
58.00							
56.00							
54.00							
52.00							
50.00							
48.00							
46.00							
44.00							
42.00							
40.00							
38.00							
36.00							
34.00							
32.00							
30.00							
28.00							
26.00							
24.00							
22.00							
20.00							
18.00							
16.00							
14.00							
12.00							
10.00							
8.00							
6.00							
5.00							
4.00							
3.50							
3.00							
2.50							
2.00						T	
1.50					T	T	
1.25							
1.00			T		T	T	
0.75		T	T		T	T	
0.50	T	T	T		T	S	

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
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B20K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	2	2	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP/1	PIPE	.5	.5	7.47	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	710
NIP/	NIPPLE	.5	1.5	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FSCD847Z0	709
FLG	FLNG.WN	.5	.5	160S	B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FWCD847Z0	709
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FWCD847Z0	709
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FBCD847Z0	709
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 182 GR.F304/304L	300, FF/125AARH	FGKD841Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	

Package : IPMCS
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B20K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	
O'let Group									
SLT	SOCKOLET	.5	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
Valves Group									
CHV	VLV.CHECK	.5	1		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530YA	530YAZZZ0	831,715
CHV	VLV.CHECK	1.5	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535YA	535YAZZZ0	829,705, 715
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544ZA	544ZAZZZ0	722,715, 720,721, 724,725, 990
BLV	VLV.BALL	2	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544YA	544YAZZZ0	830,715, 724,730
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544KA	544KAZZZ0	727,715, 720,721, 724,728, 990
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 300	GK69774Z0	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20Y** Sheet 1 of 3

PIPE CLASS : **B20Y**
RATING : 300
BASE MATERIAL : TEFLON LINED CS
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	52.02	52.02	47.8	46.05

SERVICE

SPENT CAUSTIC, SULFURIC ACID

NOTES

42 ALL WELDS SHALL BE STRESS RELIEVED.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 ALL COMPONENTS OTHER THAN VALVES SHALL BE PTFE LINED IN ACCORDANCE WITH ASTM F1545

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20Y** Sheet 2 of 3

BRANCH PIPE (SIZE IN INCHES)

BRANCH PIPE	.50	.75	1.00	1.25	1.50	2.00	2.50	BRANCH PIPE
84.00								84.00
80.00								80.00
76.00								76.00
72.00								72.00
70.00								70.00
68.00								68.00
66.00								66.00
64.00								64.00
62.00								62.00
60.00								60.00
58.00								58.00
56.00								56.00
54.00								54.00
52.00								52.00
50.00								50.00
48.00								48.00
46.00								46.00
44.00								44.00
42.00								42.00
40.00								40.00
38.00								38.00
36.00								36.00
34.00								34.00
32.00								32.00
30.00								30.00
28.00								28.00
26.00								26.00
24.00								24.00
22.00								22.00
20.00								20.00
18.00								18.00
16.00								16.00
14.00								14.00
12.00								12.00
10.00								10.00
8.00								8.00
6.00								6.00
5.00								5.00
4.00								4.00
3.50								3.50
3.00								3.00
2.50								2.50
2.00						T		2.00
1.50					T	T		1.50
1.25								1.25
1.00			T		T	T		1.00
0.75		T	T		T	T		0.75
0.50	T	T	T		T	W		0.50

RUN PIPE (SIZE IN INCHES)

BRANCH PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B20Y

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B20Y** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B(PTFE LINED)	BE, SEAMLESS	PI22417Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B(PTFE LINED)	BE, SEAMLESS	PI22417Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B(PTFE LINED)	BE, SEAMLESS	PI22417Z0	
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B(PTFE LINED)	PBE, SEAMLESS	PN22467Z0	
Flange Group									
FLG	FLNG.WN	.5	2	M	B-16.5	ASTM A 105 (PTFE LINED)	300, RF/125AARH	FWC0547Z0	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105 (PTFE LINED)	300, RF/125AARH	FBC0547Z0	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105 (PTFE LINED)	300, FF/125AARH	FGK0541Z0	
Fitting Group									
ELB90	ELBOW.90	.5	2	M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW, 1.5D	WAG734Z10	
ELB45	ELBOW.45	.5	2	M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW, 1.5D	WBG734Z10	
TEQ	T.EQUAL	.5	2	M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW	WEG734ZZ0	
TRED	T.RED	.5	2	M, M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW	WRG734ZZ0	
REDC	REDUC.CONC	.5	2	M, M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW	WUG734ZZ0	
REDE	REDUC.ECC	.5	2	M, M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW	WVG734ZZ0	
CAP	CAP	.5	2	M	B-16.9	ASTM A 234 GR.WPB(PTFE LINED)	BW	WFG734ZZ0	
O'let Group									
WLT	WELDOLET	.5	2	M, M	MSS-SP97	ASTM A 105 (PTFE LINED)	BW	YWS064ZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	2		B-16.21-ANSI B16.5	GARLOCK STYLE 3540/GORETEX GR	RING, 300, 2 MM	GKBCD54Z0	

Package : IPMCS
Report No. : 50

B20Y

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 1 of 6

PIPE CLASS : **B21A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	52	52	40.1	26.7	13.4

SERVICE

T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP16)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

701 HYDROSTATIC TEST WITH WATER IS NOT PERMITTED. USE MINERAL OIL.

703 NPS 1/2 PIPING IS USED FOR MANY ALKYL LINES SO THE INTERNAL CONTAINED VOLUME IS SMALL. THESE SMALL LINES LACK THE MECHANICAL STRENGTH NECESSARY TO SUPPORT THEMSELVES ACROSS LONG SPANS (AS IN A PIPE RACK) OR TO PROVIDE PROTECTION FROM MECHANICAL DAMAGE FROM IMPACT.

704 (CONTINUED FROM NOTE 703) LONG RUNS IN THE PIPE RACKS AND PIPING THAT ARE POTENTIALLY EXPOSED TO MECHANICAL IMPACT NEED TO BE PROTECTED BY STEEL CHANNEL WITH A STRENGTH EQUAL OR GREATER THAN 4 INCH WIDTH AND WEIGHT PER FOOT OF NO LESS THAN 7.4.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

708 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING, AND COVER ALL EXPOSED THREADS WITH WELD.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

711 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES. NOMINAL 5,000 PSI SEATING STRESS.

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

714 FOR PRESSURE GUAGE ASSEMBLY: FOR ALKYL SERVICE, CHEMICAL ATTACHMENTS ARE TO BE USED. DIAPHRAGM IS TO BE CONSTRUCTED OF 304 STAINLESS STEEL AND WELDED TO THE TOP HOUSING. FLUSH CONNECTION IS TO BE PROVIDED. REFER TO TYPICAL SKETCH NUMBER 26 IN THE SUPPLEMENT TO PROCESS PARTS.

715 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC. WELDED VALVES ARE PREFERRED TO MINIMIZE THE NUMBER OF POTENTIAL LEAK POINTS.

717 WAFER INSERT TYPE;PTFE SEAT;SS316 SPRING;REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG;CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150, CLASS 300 OR CLASS 600 FLANGES;TO BE USED WITH SCHEDULE 80 OR THINNER WALL PIPE.

718 VALVE; CHECK; ASME B16.34; CLASS 600; X-STRONG; CAST; CARBON STEEL; ASTM A 216 GRADE WCB;

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

722 BALL VLV, B16.34; 1000 PSI; SW; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

723 END ENTRY; 316SS STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; 1 1/2; 3; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL;

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 2 of 6

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

727 BALL VLV, ASME B16.34; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7, 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

729 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2": STR-354 IS TO BE FOLLOWED

730 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

831 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A

909 LICENSOR PMS LGP16 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

975 THIS VALVE SHALL BE USED AS PRIMARY PREFERENCE ONLY IN SIZES 0.5" TO 1". FOR SIZE 1.5", THIS VALVE SHALL BE USED ONLY IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE/ P&ID.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

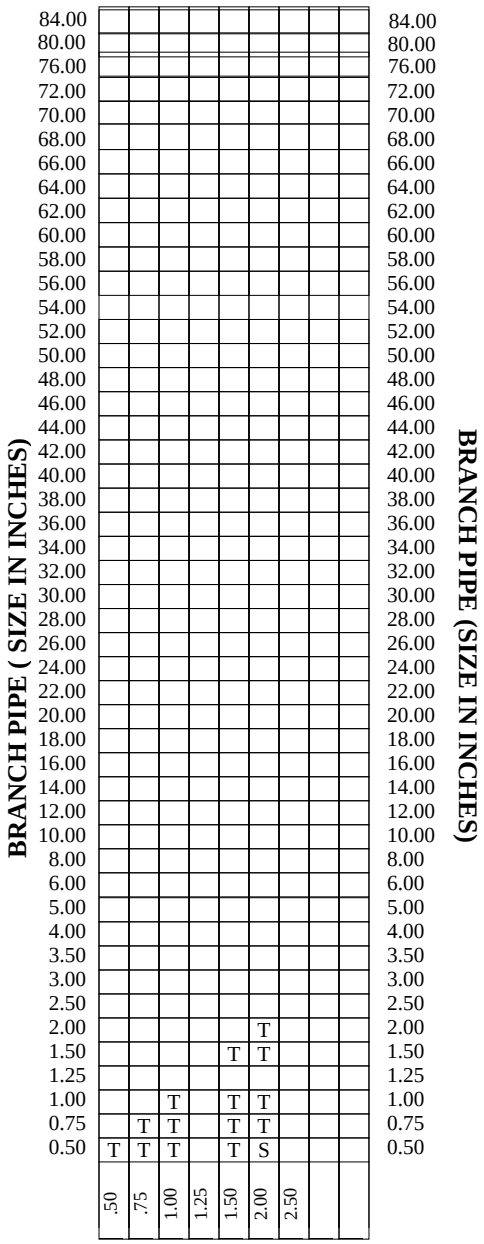
990 RECOMMENDED BALL VALVE MANUFACTURES FOR USE IN T2(TEAL) SERVICE SHALL BE AS PER LICENSOR SPECIFICATION LSTD-3 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-909	
	ON LINES >= 2.0"	NOTE-909	
VENTS	ON LINES <= 1.5"	NOTE-909	
	ON LINES >= 2.0"	NOTE-909	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-909)	
PRESS.CONN	0.75"	NOTE-909	

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Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B21A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP/1	PIPE	.5	.5	XXS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	710
NIP/	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	709
FLG	FLNG.WN	.5	.5	XXS	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	709
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	709
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	709
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
Valves Group									
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530PA	530PAZZZ0	831,975, 715
CHV/1	VLV.CHECK	1.5	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535RA	535RAZZZ0	718,705, 717,715
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544PA	544PAZZZ0	722,720, 721,724, 725,715, 990
BLV	VLV.BALL	2	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544RA	544RAZZZ0	723,724, 725,730, 715
BLV/2	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544UA	544UAZZZ0	722,720, 721,724, 726,710, 715,990

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544VA	544VAZZZ0	727,720, 721,724, 728,715, 990
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21P** Sheet 1 of 4

PIPE CLASS : **B21P**
RATING : 300
BASE MATERIAL : ALLOY 20
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	52.73	52.73	52.02	49.91	47.81

SERVICE

SULFURIC ACID

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

111 USE STABILIZED ANNEALED MATERIAL ONLY.

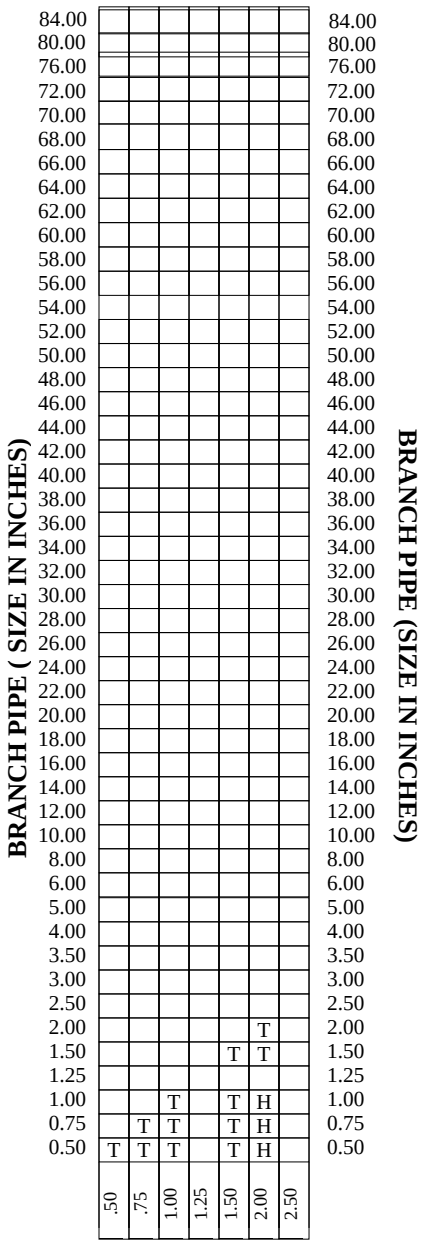
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTENANCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP. CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS. CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21P** Sheet 2 of 4



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B21P

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21P** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	CALC	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PE, SEAMLESS	PI3D277Z0	111
PIP	PIPE	1	1.5	CALC	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PE, SEAMLESS	PI3D277Z0	111
PIP	PIPE	2	2	CALC	B-36.19	ASTM B 729 ANNLD (UNS N08020)	BE, SEAMLESS	PI3D217Z0	111
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM B 729 ANNLD (UNS N08020)	PBE, SEAMLESS	PN3D267Z0	111
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM B 462 UNS N08020	300, RF/125AARH	FSCG547Z0	111
FLG	FLNG.WN	2	2	M	B-16.5	ASTM B 462 UNS N08020	300, RF/125AARH	FWCG547Z0	111
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM B 462 UNS N08020	300, RF/125AARH	FBCG547Z0	111
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM B 462 UNS N08020	300, FF/125AARH	FGKG541Z0	111
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WA6AFD2Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW, 1.5D	WAGC84Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WB6AFD2Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW, 1.5D	WBGC84Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WE6AFD2Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WEGC84ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WR6AFD2Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WRGC84ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM B 462 UNS NO8020	PBE	WNHAF6ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM B 462 UNS NO8020	PBE	WPHAF6ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM B 366ANLD WP20CB-S N08020	BW	WFGC84ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WJ6AFD2Z0	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21P** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WK6AFD2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WL6AFD2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM B 462 UNS NO8020	SW, 3000	WM6AFD2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 510DR	510DRZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 520DR	520DRZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	SW, 800, 3000, B-16.11, SHT NO.- 530DR	530DRZZZ0	
BLV	VLV.BALL	.5	1.5		BS EN ISO 17292	ASTM A351 GR.CN7M (SOLUTION ANNEALED),TRIM -ALLOY 20	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544DR	544DRZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND UNS N08020+PTFE+I RING	SPIRAL, 300	GK6CE74Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21Q** Sheet 1 of 4

PIPE CLASS : **B21Q**
RATING : 300
BASE MATERIAL : INCONEL 600
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	52.73	52.73	52.73	51.32	49.56	46.75

SERVICE

SPENT CAUSTIC

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

185 VERMICULITE FILLER OR AMORPHOUS POLYSILIC ACID FIBRES WITH TALC FILLER.

234 GASKET SHALL BE SPIRAL WOUND TYPE.

236 ALL ALLOY UNS N06600 MATERIAL SHALL BE SUPPLIED IN ANNEALED CONDITION.

238 EACH CASTING SHALL MEET THE HYDROSTATIC TEST REQUIREMENTS OF ASTM SPECIFICATION A 703.

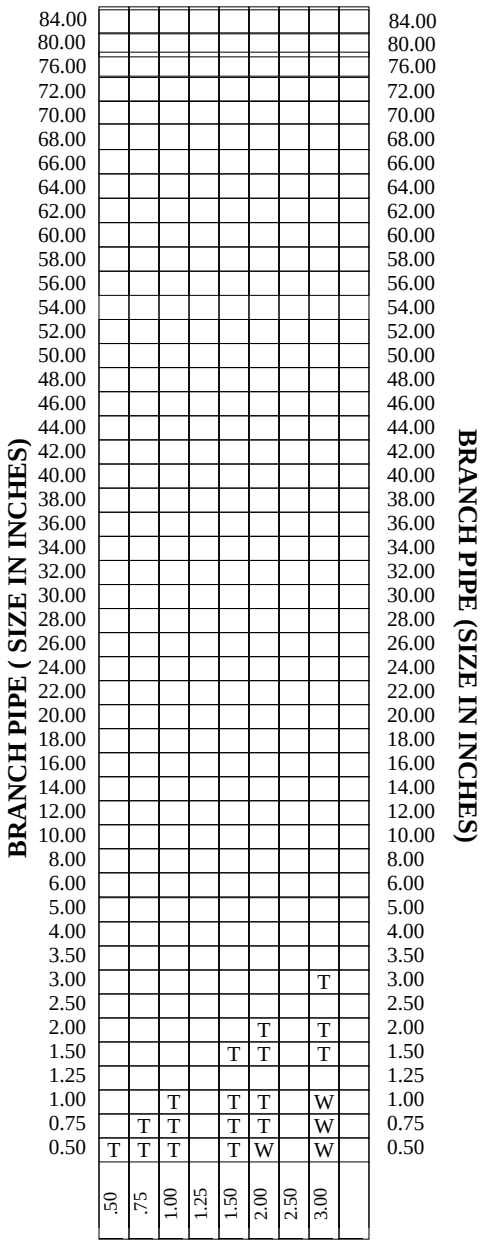
240 NO ELASTOMERIC COMPONENTS SHALL BE ALLOWED IN THE VALVES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Location BINA, MADHYA PRADESH	**Pipe Class :B21Q** Sheet 2 of 4



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B21Q

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21Q** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	CALC	B-36.19	ASTM B 167 (UNS N06600)	BE, SEAMLESS	PI3C817Z0	
PIP	PIPE	2	3	CALC	B-36.19	ASTM B 167 (UNS N06600)	BE, SEAMLESS	PI3C817Z0	
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM B 167 (UNS N06600)	PBE, SEAMLESS	PN3C867Z0	
Flange Group									
FLG	FLNG.WN	.5	3	M	B-16.5	ASTM B 564 (UNS N06600) ANNLD	300, RF/125AARH	FWCN847Z0	236
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM B 564 (UNS N06600) ANNLD	300, RF/125AARH	FBCN847Z0	236
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM B 564 (UNS N06600) ANNLD	300, FF/125AARH	FGKN841Z0	236
Fitting Group									
ELB90	ELBOW.90	.5	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW, 1.5D	WAGC94Z10	
ELB45	ELBOW.45	.5	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW, 1.5D	WBGC94Z10	
TEQ	T.EQUAL	.5	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WEGC94ZZ0	
TRED	T.RED	.5	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WRGC94ZZ0	
REDC	REDUC.CONC	.5	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WUGC94ZZ0	
REDE	REDUC.ECC	.5	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WVGC94ZZ0	
CAP	CAP	.5	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WFGC94ZZ0	
O'let Group									
WLT	WELDOLET	.5	3	M, M	MSS-SP97	ASTM B 564 (UNS N06600)	BW	YWSD94ZZ0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 600/ ISO 10434	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-ALLOY 600 (UNS N06600)	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514AU	514AUZZZ0	
GLV	VLV.GLOBE	.5	1.5		BS-1873	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524AU	524AUZZZ0	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B21Q** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						ALLOY 600 (UNS N06600)			
CHV	VLV.CHECK	.5	1.5		BS-1868	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-ALLOY 600 (UNS N06600)	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534AU	534AUZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	3		B-16.20-ANSI B16.5	UNS N06600+VRMICULITE+N06600IR	SPIRAL, 300	GK6EU74Z0 / 234	185

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B24A** Sheet 1 of 5

PIPE CLASS : **B24A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	52	52	47.5	46	44.6	42.2

SERVICE

HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP21)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

732 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS
ENGINEER PER ASME B31.3 PARAGRAPH 301.5.4. (CONT.)

733 (CONT. FROM NOTE NO. 732) IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

753 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL.

755 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM;BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

760 IN ORDER TO ELIMINATE THE OCCURRENCE OF POTENTIAL STRESS RISERS DETRIMENTAL TO PIPING IN CYCLIC SERVICES, EXTRA CARE MUST BE TAKEN DURING FABRICATION. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO WELDING. WHEREVER POSSIBLE, THE INSIDE SURFACE OF BUTT WELDS SHALL BE GROUND FLUSH.

761 ALL INTERNAL WELD SPLATTER AND BURRS SHALL BE REMOVED. THE GTAW WELD PROCESS SHALL BE USED FOR THE ROOT PASS OF ALL BUTT WELDS TO PROMOTE A SMOOTH INNER BORE; ROOT PENETRATION SHALL BE KEPT TO A MINIMUM.

762 ALL HOLES FOR (SET-ON STYLE) "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING, OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE; A STRAIGHT BORE OLET IS REQUIRED FOR THESE APPLICATIONS.

774 FLANGED; CAST; CARBON STEEL;RISING STEM; OS&Y; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET:

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Location BINA, MADHYA PRADESH	**Pipe Class :B24A** Sheet 2 of 5

CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 4, GEAR LARGER SIZES;

775 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

776 FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; OS&Y; BONNET: BOLTED; RISING STEM; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES;

806 PIPING SUPPORT LOCATION MUST BE DETERMINED IN CONCERT WITH THE ANALOG TECHNOLOGIST TO AVOID HARMONICS DUE TO VIBRATION AND THE STRESS ANALYST TO AVOID EXCESSIVE THERMAL STRESSES / STRAINS. 'HOLD DOWN' TYPE SUPPORTS WILL TYPICALLY BE REQUIRED.

815 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.
FOR SIZE RANGE 3/4" TO 1" : STR-366 IS TO BE FOLLOWED

856 CAST; TOP ENTRY; EXTENDED BONNET, BOLTED; BOLTING:ASTM A 193 GR B7;GASKET:GRAPHITE/METAL/METAL WITH GRAPHITE; SS316 STEM & BALL; GRAPHITE SEATING; FLEXIBLE GRAPHITE PACKING;(STEM SEALS OR PACKING); EXTERNAL BALL STOP(INTERNAL WELD) TO BE SUPPLIED; OPERATOR: LEVER UPTO 4" & WEATHERPROOF GEAR ABOVE 4"

857 ASME B16.34/16.10 LONG PATTERN

858 VALVE; GATE; API 602; CLASS 800; PLAIN ENDX NPTF; FORGED; CARBON STEEL; ASTM A 105; EXTENDED BODY; OS&Y; RISING STEM; REDUCED PORT TYPE;BONNET: WELDED; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

910 LICENSOR PMS LGP21 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

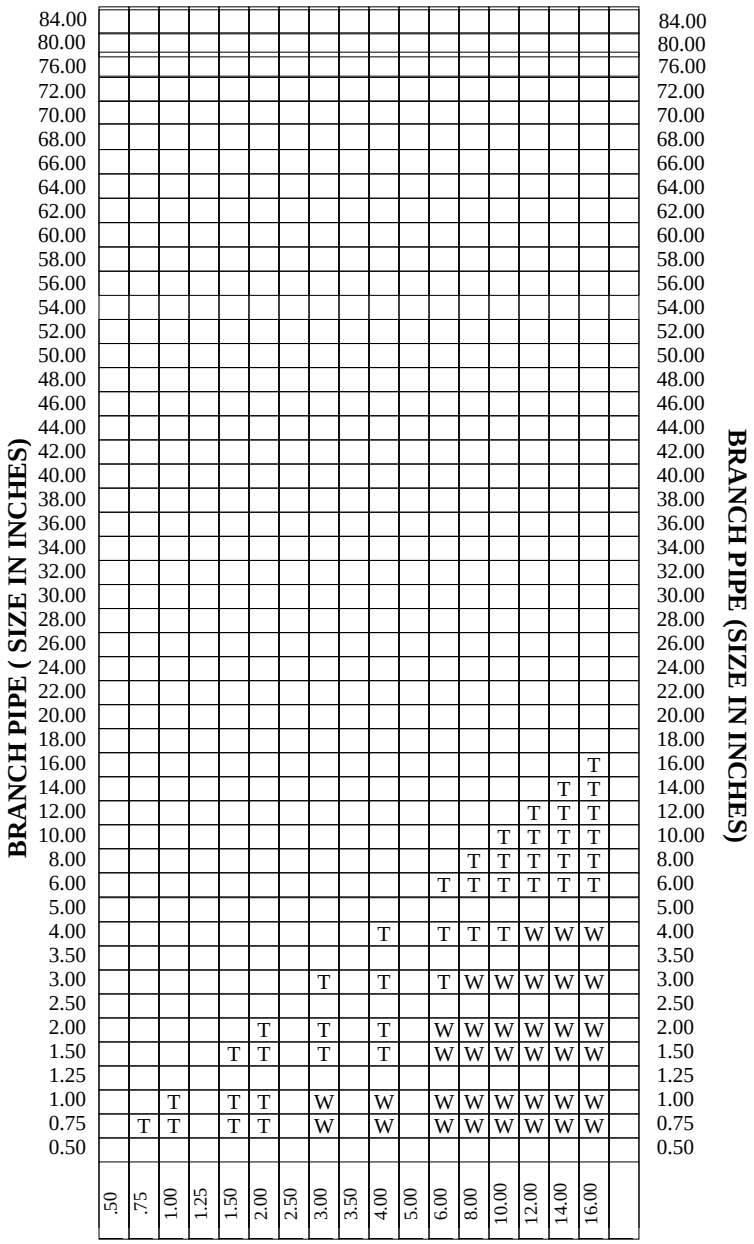
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-910	
	ON LINES >= 2.0"	NOTE-910	
VENTS	ON LINES <= 1.5"	NOTE-910	
	ON LINES >= 2.0"	NOTE-910	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-910)	
PRESS.CONN	0.75"	NOTE-910	

Package : IPMCS

Report No. : 50

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B24A** Sheet 3 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B24A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B24A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	12	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	

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B24A

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Location BINA, MADHYA PRADESH	**Pipe Class :B24A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	.75	16	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
O'let Group									
WLT	WELDOLET	.75	12	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514UB	514UBZZZ0	755,725, 742
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514PB	514PBZZZ0	774,726, 742
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-1.20.1, REFER VMS SHT, SHT NO.- 510UB	510UBZZZ0	858,728, 742
GLV	VLV.GLOBE	.75	1.5		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524UB	524UBZZZ0	775,742
GLV	VLV.GLOBE	2	10		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524PB	524PBZZZ0	776,742
BLV	VLV.BALL	.75	8		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544PB	544PBZZZ0	856,725, 742,753, 857
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	16		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	731

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Location BINA, MADHYA PRADESH	**Pipe Class :B27A** Sheet 1 of 7

PIPE CLASS : **B27A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	52	52	47.5	46	44.6

SERVICE

PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) (BASED ON LICENSOR PMS CLASS - LPZ18)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

319 PROVIDE WELDED GROUNDING CLIPS AT FLANGED EQUIPMENT AND ON BOTH SIDES OF FLANGED JOINTS.

549 RUN AN ELECTRICAL CONTINUITY TEST EACH TIME THE PIPEWORK IS ASSEMBLED, AND AT LEAST ONCE A YEAR.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

732 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS ENGINEER PER ASME B31.3 PARAGRAPH 301.5.4. (CONT.)

733 (CONT. FROM NOTE NO. 732) IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED

734 PIPE BETWEEN THE REACTOR AND THE PRODUCT CHAMBER TO BE SUBJECTED TO FATIGUE ANALYSIS IN ADDITION TO THERMAL ANALYSIS TO DETERMINE IF A THICKNESS ABOVE THAT LISTED FOR PRESSURE IS REQUIRED.

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

736 EXERCISE SPECIAL CARE DURING FABRICATION TO MINIMIZE OBSTRUCTIONS TO FLOW. REMOVE MILL SCALE FROM PIPE ENDS BEFORE WELDING. GTAW SHALL BE USED FOR THE ROOT PASS OF ALL WELDS. ROOT PENETRATION SHALL BE KEPT AT A MINIMUM..

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

740 THIS SERVICE REQUIRES A TWO-STEP LEAK TEST. THE FIRST STEP IS A 'SENSITIVE' LEAK TEST. THIS IS FOLLOWED BY A HYDROSTATIC OR PNEUMATIC TEST AS SPECIFIED.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

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752 THE BEND RADIUS MINIMUM TANGENT AND TOLERANCE SPECIFICATIONS SHALL BE IN ACCORDANCE WITH ENGINEERING DETAIL LSTD-2 'PNEUMATIC CONVEYING PIPE BEND DIMENSIONAL TOLERANCES' INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS VOLUME 2, SECTION 1X-2.

754 FIRE WATER SPRAY PROTECTION SHALL BE PROVIDED FOR IN-LINE NON-FIRE TESTED VALVES

755 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM;BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

773 FOR PIPING SYSTEMS SUBJECT TO VIBRATION, BRACING OF PERMANENT VENTS AND DRAINS SHOULD BE CONSIDERED

774 FLANGED; CAST; CARBON STEEL;RISING STEM; OS&Y; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 4, GEAR LARGER SIZES;

775 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

776 FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; OS&Y; BONNET: BOLTED; RISING STEM; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES;

777 VALVE; CHECK; ASME B16.34; CLASS 300; RAISED FACE; FLANGED; FORGED; CARBON STEEL; ASTM A 105; PISTONLIFT CHECK; SPRING LOADED; COVER: BOLTED; HORIZONTAL TYPE; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; SPRING: STAINLESS STEEL;

778 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; ASME B16.5;

780 VALVE; BALL; CLASS 300; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; BOLTING: ASTM A 193 GR B7; STAINLESS STEEL STEM; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: LEVER;

781 VALVE; BALL; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; BOLTING: ASTM A 193 GR B7; HARDENED STAINLESS STEEL STEM; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: WEATHERPROOF GEAR

782 VALVE; BALL; CLASS 300; RAISED FACE; FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; TRUNNION MOUNTED; BOLTING: ASTM A 193 GR B7; HARDENED STAINLESS STEEL STEM; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: WEATHERPROOF GEAR;

785 DOUBLE FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; BOLTING: ASTM A 193 GR B7; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; STAINLESS STEEL STEM; SEATING: METAL; SEATING RING: METAL OR METAL/GRAPHITE; CARBON STEEL DISC; PACKING: FLEXIBLE GRAPHITE; OPERATOR: WEATHERPROOF GEAR; ASME B16.5;

786 8-THREAD SERIES BOLTS ARE REQUIRED WHEN THE FLANGE BOLT DIAMETER IS 1 1/8 INCH OR LARGER PER ASTM A 193; THE PREFERRED INSTALLATION IS WITH THE STEM IN THE HORIZONTAL POSITION.

787 (CONT. FROM NOTE NO. 786) VALVE SHALL BE BI-DIRECTIONAL AND CAPABLE OF DEAD END SERVICE AT FULL-RATED PRESSURE. PRIOR TO INSTALLATION ASSURE THAT FLANGE GASKET FACE INCLUDING THE RETAINER RING AND BOLTING ARE SUITABLE TO PROVIDE SEALING WITH THE SELECTED GASKET.

791 VALVE; GATE; API 602; CLASS 800; BUTT WELDING X NPTF; FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: WELDED; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

926 LICENSOR PMS LPZ18 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

955 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE ONLY, IF MENTIONED IN PROCESS DESIGN PACKAGE OR P&ID.

956 1000 PSI; BUTT WELDING X NPTF; X-STRONG; CAST; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; GASKET: GRAPHITE/METAL/METAL WITH GRAPHITE; 17-4PH SS STEM; SEATING:METAL WITH GRAPHITE; COATED SS316 BALL; PACKING: FLEXIBLE GRAPHITE;(STEM SEALS OR PACKING); OPERATOR:LEVER; PREPARED FOR GAS PHASE PE/PP SERVICE

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

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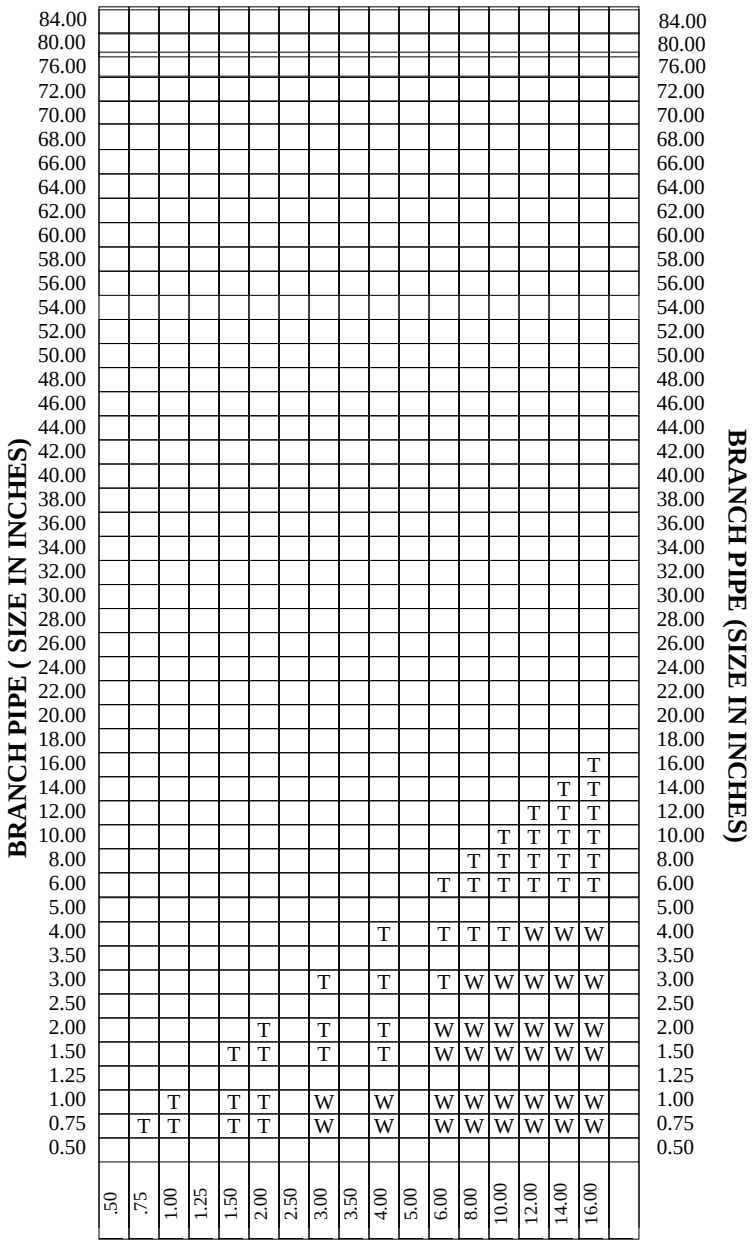
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Location BINA, MADHYA PRADESH	**Pipe Class :B27A** Sheet 3 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-926	
	ON LINES >= 2.0"	NOTE-926	
VENTS	ON LINES <= 1.5"	NOTE-926	
	ON LINES >= 2.0"	NOTE-926	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-926)	
PRESS.CONN	0.75"	NOTE-926	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	S40	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
BND	PIPE.BEND	.75	6	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 3D	WCI6843Z0	752
BND	PIPE.BEND	16	16	M	ASME B31.3	ASTM A 234 GR.WPB-W	BW, 9D	WCI7548Z0	752
BND/2	PIPE.BEND	2	12	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 4D	WCI6844Z0	752
BND/1	PIPE.BEND	2	14	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 9D	WCI6848Z0	752
TEQ	T.EQUAL	.75	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.75	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	

Package : **IPMCS**
Report No. : **50**

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDE	REDUC.ECC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
CAP	CAP	.75	16	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
O'let Group									
WLT	WELDOLET	.75	1.5	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
WLT	WELDOLET	2	6	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514TE	514TEZZZ0	755,725, 742,754
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514PC	514PCZZZ0	774,726, 742,754
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510PC	510PCZZZ0	791,725, 728,742, 754,773
GLV	VLV.GLOBE	.75	1.5		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524TE	524TEZZZ0	775,742, 754
GLV	VLV.GLOBE	2	12		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524PC	524PCZZZ0	776,742, 754
CHV	VLV.CHECK	.75	1.5		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534TE	534TEZZZ0	777,742, 754
CHV	VLV.CHECK	2	16		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534PC	534PCZZZ0	778,742, 754
BLV	VLV.BALL	.75	4		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544TE	544TEZZZ0	780,720, 726,742, 754
BLV	VLV.BALL	6	6		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544PC	544PCZZZ0	781,726, 742,754
BLV	VLV.BALL	8	16		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544PC	544PCZZZ0	782,726, 742,754
BLV/1	VLV.BALL	.75	.75		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	SPCL, 1000, 3000, B-16.25, REFER VMS SHT, SHT NO.- 544UC	544UCZZZ0	956,720, 721,725, 955

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BFV	VLV.BTRFLY	6	16		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,STEM-STAINLESS STEEL, DISC-CARBON STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 564PC	564PCZZZ0	785,742, 754,786, 787
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	16		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 300	GK69774Z0	731

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PIPE CLASS : **B28A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	46.7	46.7	46.7	46	44.6

SERVICE

CYCLE GAS (BASED ON LICENSOR PMS CLASS - LGP24)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

730 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

754 FIRE WATER SPRAY PROTECTION SHALL BE PROVIDED FOR IN-LINE NON-FIRE TESTED VALVES

755 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM;BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

774 FLANGED; CAST; CARBON STEEL;RISING STEM; OS&Y; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 4, GEAR LARGER SIZES;

776 FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; OS&Y; BONNET: BOLTED; RISING STEM; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES;

827 PIPING SYSTEMS CONSTRUCTED TO THIS SPECIFICATION TO CONSIST OF FABRICATED PIPE SPOOLS THAT ARE PRE-TESTED BY MEANS OF CLASS C - HYDROSTATIC TESTING AT THE MAXIMUM ALLOWABLE TEST PRESSURE THEN CLEANED / DRIED PRIOR TO INSTALLATION AND FINAL INSTALLED SYSTEM CLASS DH - PNEUMATIC TEST.

828 EXERCISE SPECIAL CARE DURING FABRICATION TO MINIMIZE OBSTRUCTIONS TO FLOW. GRIND ALL ACCESSIBLE WELDS FLUSH WITH THE ID AND REMOVE ALL INTERNAL WELD SPLATTER. USE THE GTAW PROCESS OR CONSUMABLE INSERTS FOR THE ROOT PASS OF ALL WELDS THAT CANNOT BE ACCESSED FOR GRINDING

831 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A

858 VALVE; GATE; API 602; CLASS 800; PLAIN ENDX NPTF; FORGED; CARBON STEEL; ASTM A 105; EXTENDED BODY; OS&Y; RISING STEM; REDUCED PORT TYPE;BONNET: WELDED; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

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928 3-PLY CORRUGATED; SS316(UNS S31600); METAL GASKET WITH CORRUGATED METAL FILLER (CORE); 1/8 INCH THICK (NOMINAL); PITCH OF CORRUGATIONS: 3/16 INCH; JACKET MATERIAL: 0.019 INCH THICK; FILLER (CORE): 1/32 INCH THICK; WITH CENTERING TABS(CONT.)

929 (CONTINUED FROM NOTE-926) BOTH SIDES OF 3-PLY GASKET TO BE FURNISHED WITH ONE LAYER OF 0.015" THICK FLEXIBLE GRAPHITE ADHESIVE BACKED TAPE; TAPE SHALL PROVIDE COMPLETE COVERAGE OF THE CONTACT AREA OF THE INSTALLED GASKET WITH A MIN. NUMBER OF JOINTS HAVING AN OVERLAP NOT EXCEEDING 1/16 INCH(CONT.)

930 (CONTINUED FROM NOTE-927) FOR DIMENSIONS AND INSTALLATION, SEE LPPM-21 (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2); DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS.

932 VALVE; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; OS&Y; BONNET: WELDED; RISING STEM; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL.

933 VALVE; CHECK; RAISED FACE; TAPPED LUG OR DOUBLE FLG; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; DUAL-PLATE WAFER-LUG STYLE; API TRIM #8 / 8A; CARBON STEEL DISC; SPRING: INCONEL; ASME B16.5 / B16.47 SERIES A.

934 1000 PSI; CAST; REDUCED PORT TYPE; 3- PIECE BODY; BOLTING: ASTM A 193 GR B7; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; 17-4 PH STAINLESS STEEL STEM; SEATING: METAL WITH GRAPHITE; COATED 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER.

935 VALVE; BALL; ASME B16.34 / 16.10 SHORT PATTERN; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; BOLTING: ASTM A 193 GR B7; 17-4PH STAINLESS STEEL STEM; SEATING: PEEK; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: LEVER.

936 VALVE; BALL; API 6D / ISO 14313; CAST; FULL PORT TYPE; TRUNNION MOUNTED; BOLTING: ASTM A 193 GR B7; 316 STAINLESS STEEL STEM; SEATING: PEEK; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); LUBRICANT / DRAIN FITTING; OPERATOR: WEATHERPROOF GEAR.

937 VALVE; BALL; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; FULL PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 STAINLESS STEEL STEM; SEATING: PEEK; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER.

941 LICENSOR PMS LGP24 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

989 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2"-10": STR-354 IS TO BE FOLLOWED

SPECIAL NOTES

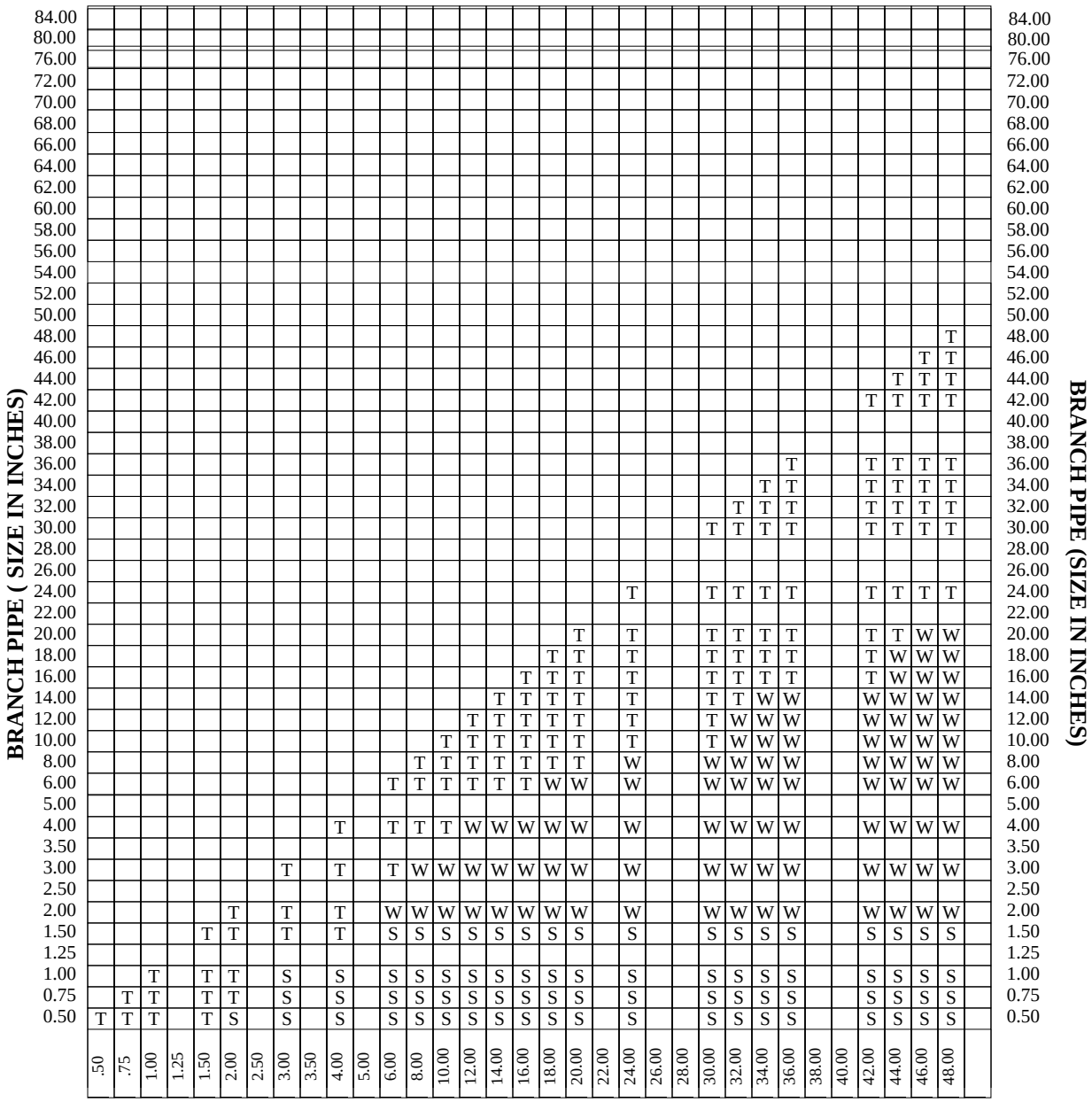
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-941	
	ON LINES >= 2.0"	NOTE-941	
VENTS	ON LINES <= 1.5"	NOTE-941	
	ON LINES >= 2.0"	NOTE-941	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-941)	
PRESS.CONN	0.75"	NOTE-941	

Package : IPMCS

Report No. : 50

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	12	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	14	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	18	XS	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
PIP	PIPE	20	24	S40	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
PIP	PIPE	30	36	19.1	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
PIP	PIPE	42	48	22.2	B-36.10	ASTM A 672 GR.C70 CL.32	BE, E.FS.W	PI2B613Z0	
NIP/	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	TBE, SEAMLESS	PN219E7Z0	
NIP/	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	TBE, SEAMLESS	PN219E7Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.WN	30	36	M	B-16.47-A	ASTM A 105	300, RF/125AARH	FWA0147Z0	
FLG	FLNG.WN	42	48	M	B-16.47-A	ASTM A 105	300, RF/125AARH	FWA0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FLB	FLNG.BLIND	30	36		B-16.47-A	ASTM A 105	300, RF/125AARH	FBA0147Z0	
FLB	FLNG.BLIND	42	48		B-16.47-A	ASTM A 105	300, RF/125AARH	FBA0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	30	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	42	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	30	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
ELB45	ELBOW.45	42	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TEQ	T.EQUAL	30	36	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TEQ	T.EQUAL	42	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
TRED	T.RED	30	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
TRED	T.RED	42	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	30	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	42	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	30	36	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	42	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	30	36	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	42	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
WLT	WELDOLET	2	20	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510PD	510PDZZZ0	755,725, 742,754
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514PD	514PDZZZ0	774,726, 742,754
GAV	VLV.GATE	26	48		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.47 A, RF/125AARH, SHT NO.- 514UD	514UDZZZ0	774,726, 742,754
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-1.20.1, REFER VMS SHT, SHT NO.- 510UD	510UDZZZ0	858,728, 742,754
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520PD	520PDZZZ0	932,742, 754
GLV	VLV.GLOBE	2	12		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524PD	524PDZZZ0	776,742, 754
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530PD	530PDZZZ0	831,742, 754
CHV	VLV.CHECK	2	24		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, REFER VMS SHT, SHT NO.- 534PD	534PDZZZ0	933,742, 754
CHV	VLV.CHECK	26	48		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.47 A, REFER VMS SHT, SHT NO.- 534UD	534UDZZZ0	933,742, 754
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544YD	544YDZZZ0	934,720, 721,742, 754
BLV	VLV.BALL	2	6		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544PD	544PDZZZ0	935,730, 742,754
BLV	VLV.BALL	8	24		API 6D/ ISO 14313	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544UD	544UDZZZ0	936,742, 754
BLV/1	VLV.BALL	.5	.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544ZD	544ZDZZZ0	937,720, 721,728, 742,754

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	
GAS	GASKET	30	48		B-16.20-ANSI B16.47A	316S.S. 3-PLY CORRUGTED GASKET	RING, 300, 3 MM	GK4BI54Z0	928

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 1 of 6

PIPE CLASS : **B2A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

SBOILER BLOWDOWN, LP BOILER FEED WATER, MP STEAM, MP CONDENSATE-ALL IBR

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

9 CARBON CONTENT SHALL NOT EXCEED 0.25% FOR ALL PIPES,FITTINGS FLANGES ETC. THAT MAY REQUIRE WELDING. MOREOVER,FOR FLANGES THE SULPHUR AND PHOSPHOROUS SHALL ALSO BE LIMITED TO 0.05% EACH.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

133 PIPE THICKNESS HAS BEEN CALCULATED ON ACTUAL LINE CONDITION [22 KG/CM2 @ 350 DEG.C] SUBJECTED TO MIN. OF 80% OF THE CLASS CONDITIONS.

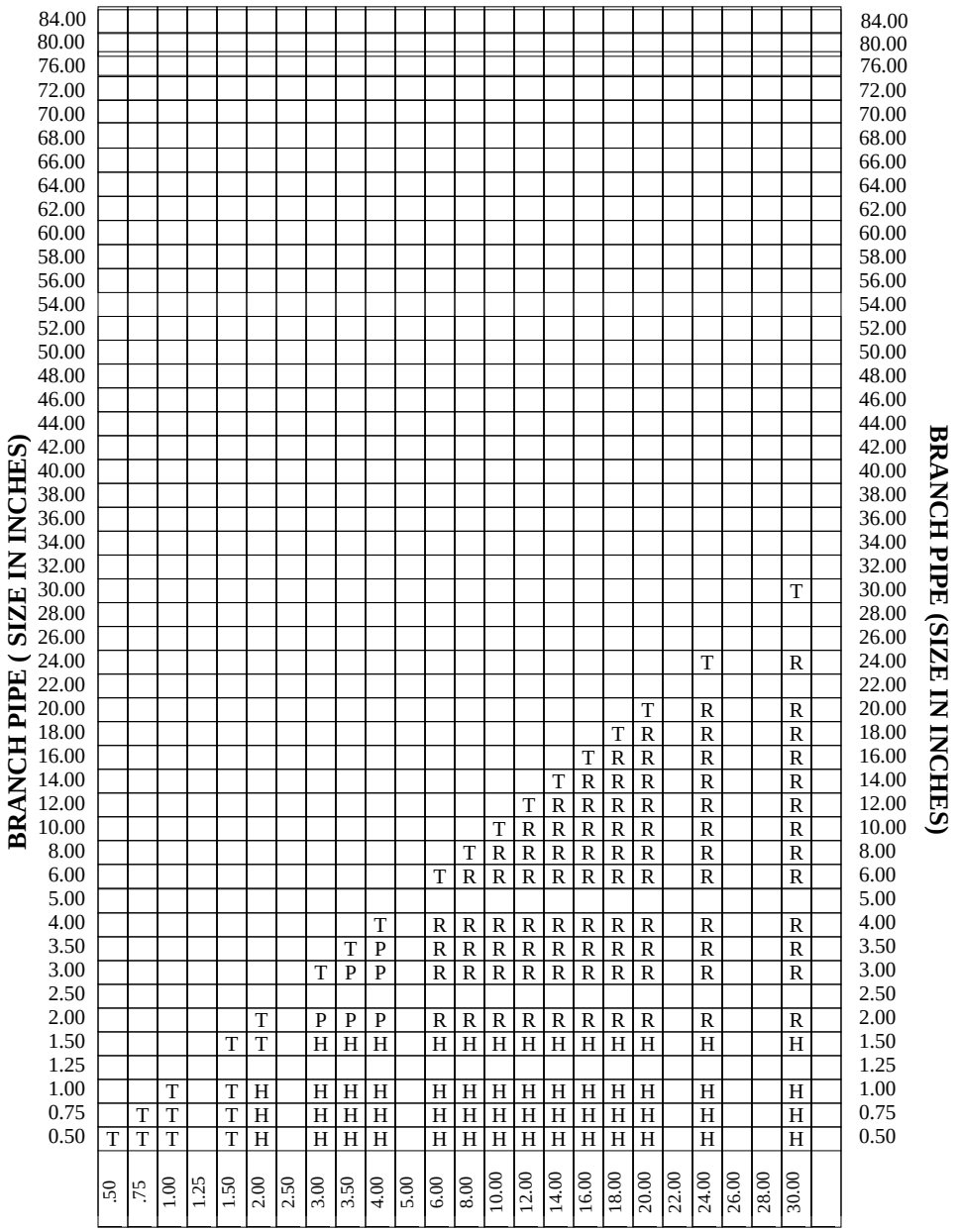
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	16	18	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	
PIP	PIPE	20	20	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	32
PIP	PIPE	24	24	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	
PIP	PIPE	30	30	S30	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	133
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z1	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z1	
FLG	FLNG.WN	30	30	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z1	
FLB	FLNG.BLIND	30	30		B-16.47-B	ASTM A 105	300, RF/125AARH	FBB0147Z1	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z1	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z1	
FEF	SPCR&BLND	30	30		ASME B16.47B/EIL' STD	ASTM A 516 GR.70	300, FF/125AARH	FCU6341Z1	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z1	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z1	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z11	
ELB90	ELBOW.90	16	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z11	

Package : IPMCS
Report No. : 50

B2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z1	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z1	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z11	
ELB45	ELBOW.45	16	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z11	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z1	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z1	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ1	
TEQ	T.EQUAL	16	30	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ1	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z1	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z1	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ1	
TRED	T.RED	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ1	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ1	
REDC	REDUC.CONC	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ1	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ1	
REDE	REDUC.ECC	16	30	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ1	
CAP	CAP	2	30	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ1	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z1	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z1	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z1	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z1	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z1	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z1	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51002	51002ZZZ1	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51402	51402ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52002	52002ZZZ1	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52402	52402ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53002	53002ZZZ1	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53402	53402ZZZ1	
G3V	VLV.PISTON	.5	1		MNF'STD	BODY-ASTM A 105,TRIM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 64002	64002ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	30		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	30		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 300,RF/125AARH	TR30655B1	
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B2A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D511	
PSR	STRNR.PERM	2	24		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 300,RF/125AARH	SP38055B1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 1 of 8

PIPE CLASS : **B40A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204	260
PRESS	48.86	48.86	46.4	45.72	44.99	43.23	41.13

SERVICE

NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -47 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETHYLENE ETC.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

116 THICKNESS HAS BEEN CALCULATED BASED ON ACTUAL LINE CONDITION [31.5 KG/CM2 @ 100 DEG.C].

128 PIPE THICKNESS HAS BEEN CALCULATED ON ACTUAL LINE CONDITION [31.5 KG/CM2 @ 100 DEG.C] SUBJECTED TO MIN. OF 80% OF THE CLASS CONDITIONS.

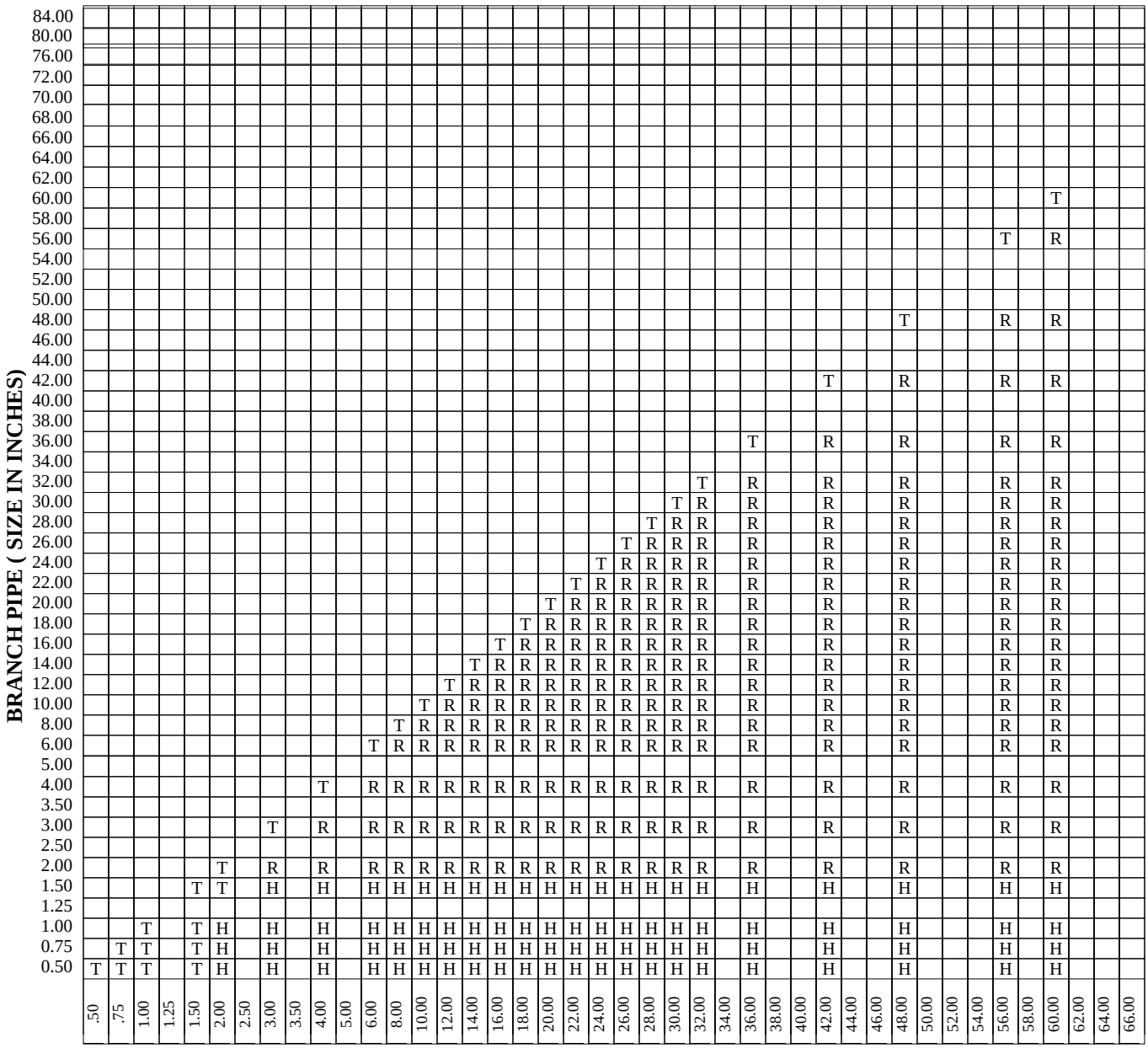
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 2 of 8



RUN PIPE (SIZE IN INCHES)

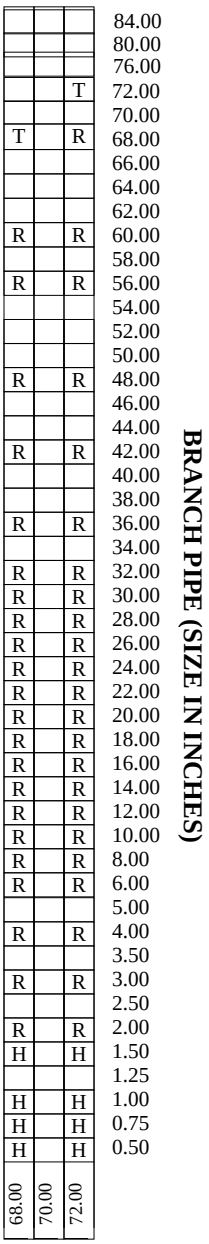
CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B40A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 3 of 8



Package : IPMCS
Report No. : 50

B40A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 4 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	12	12	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	32
PIP	PIPE	14	14	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	18	18	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	20	20	14.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	22	22	16.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	24	24	16.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	26	26	14.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128
PIP	PIPE	28	28	S30	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128
PIP	PIPE	30	30	S30	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128
PIP	PIPE	32	32	16.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128,32
PIP	PIPE	36	36	18.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128
PIP	PIPE	42	42	20.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	128,32
PIP	PIPE	48	48	20.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	116
PIP	PIPE	56	56	22.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	116
PIP	PIPE	60	60	24.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	116
PIP	PIPE	68	68	26.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	116
PIP	PIPE	72	72	28.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	116
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 5 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLG	FLNG.WN	26	60	M	B-16.47-B	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWBD747Z5	
FLG	FLNG.WN	68	72	M	JOB'STD	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWFD747Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FLB	FLNG.BLIND	26	60		B-16.47-B	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBBD747Z5	
FLB	FLNG.BLIND	68	72		JOB'STD	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBFD747Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
FEF	SPCR&BLND	26	60		ASME B16.47B/EIL' STD	ASTM A 516 GR.70(NORMALISED)	300, FF/125AARH	FCU8941Z5	
FEF	SPCR&BLND	68	72		JOB'STD	ASTM A 516 GR.70(NORMALISED)	300, FF/125AARH	FCF8941Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB90	ELBOW.90	52	72	M	JOB'STD	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAMB54Z15	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
ELB45	ELBOW.45	52	72	M	JOB'STD	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBMB54Z15	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 6 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TEQ	T.EQUAL	52	72	M	JOB'STD	ASTM A 420 GR.WPL6-W	BW	WEMB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	52	72	M, M	JOB'STD	ASTM A 420 GR.WPL6-W	BW	WRMB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDC	REDUC.CONC	52	72	M, M	JOB'STD	ASTM A 420 GR.WPL6-W	BW	WUMB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	52	72	M, M	JOB'STD	ASTM A 420 GR.WPL6-W	BW	WVMB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	48	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CAP	CAP	52	72	M	JOB'STD	ASTM A 420 GR.WPL6	BW	WFMB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 7 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51403	51403ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52403	52403ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53403	53403ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL. 1,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54403	54403ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	60		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
BOS	BOLT.STUD	52	72		JOB'STD	BOLT:A320 GR.L7, NUT:A194 GR.4		BS62007Z5	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
GAS	GASKET	26	60		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B40A** Sheet 8 of 8

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	68	72		JOB'STD	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GKF6274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS316	CONETYPE, 300,FF/125AARH, RTJ/63AARH	ST1F439Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS316	SW, Y-TYPE, 800	SP3F7D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS316	BW, T-TYPE	SP1F644Z5	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS316	BW, T-TYPE	SP1I344Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 1 of 6

PIPE CLASS : **B41A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

CLEAN HYDROCARBONS VAPOR/LIQUID OFF GAS
N-HEXANE/C6, BUTENE VAPOR, NITROGEN , LIQUID BUTENE

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

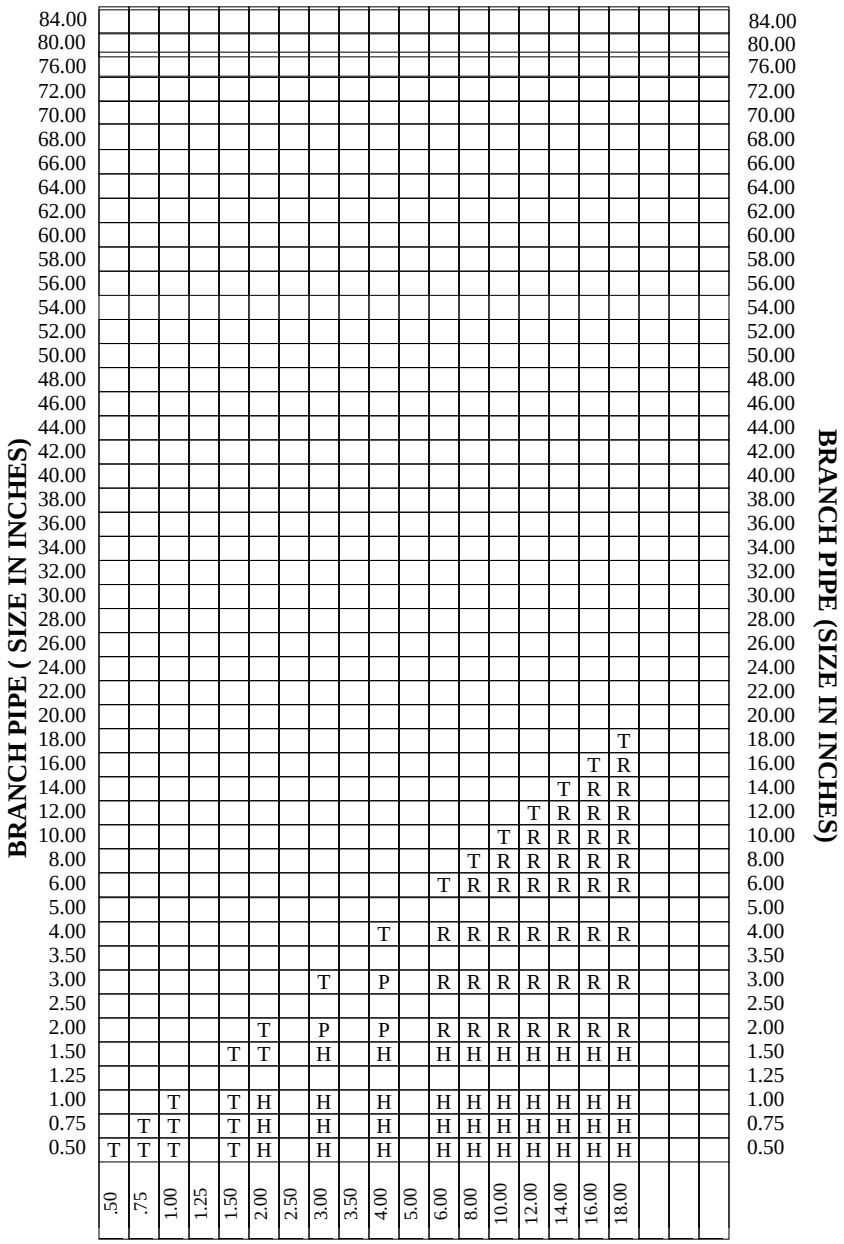
602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B41A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	18	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	18	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	18		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	18		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	18	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	18	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
BND	PIPE.BEND	.5	1.5	M	ASME B31.3	ASTM A 105	PE, 3D	WCI0273Z0	
BND	PIPE.BEND	2	14	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 3D	WCI6843Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	18	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	18	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	18	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	18	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	
CAP	CAP	2	18	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	18		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51401	51401ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52401	52401ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	18		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53401	53401ZZZ0	
BLV	VLV.BALL	.5	18		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT : RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544AE	544AEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	18		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	18		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 300,RF/125AARH	TR30655B0	
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	

Package : IPMCS
Report No. : 50

B41A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41K** Sheet 1 of 5

PIPE CLASS : **B41K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-196	38	93	120
PRESS	50.5	50.5	42.18	40.14

SERVICE

MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL-LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

51 DESIGN PRESSURE AT -29 DEG.C. AND 38 DEG.C. FOR THIS PRESSURE HAS BEEN REDUCED FROM 50.62 KG/CM2G TO 50.50 KG/CM2G TO OPTIMISE THE THICKNESS FOR 6" SIZE.

113 PIPE THICKNESS HAS BEEN CALCULATED ON ACTUAL LINE CONDITION [38.5 KG/CM2 @ 200 DEG.C] SUBJECTED TO MIN. OF 80% OF THE CLASS CONDITIONS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41K** Sheet 2 of 5

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00	38.00	40.00	42.00
84.00																														
80.00																														
76.00																														
72.00																														
70.00																														
68.00																														
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42.00																														T
40.00																														
38.00																														
36.00																											T			R
34.00																														
32.00																														
30.00																								T			R			R
28.00																														
26.00																						T		R			R			R
24.00																					T	R		R			R			R
22.00																				T	R	R		R			R			R
20.00																			T	R	R	R		R			R			R
18.00																		T	R	R	R	R		R			R			R
16.00																	T	R	R	R	R	R		R			R			R
14.00																T	R	R	R	R	R	R		R			R			R
12.00															T	R	R	R	R	R	R	R		R			R			R
10.00														T	R	R	R	R	R	R	R	R		R			R			R
8.00													T	R	R	R	R	R	R	R	R	R		R			R			R
6.00												T	R	R	R	R	R	R	R	R	R	R		R			R			R
5.00																														
4.00										T		R	R	R	R	R	R	R	R	R	R	R		R			R			R
3.50																														
3.00								T		R		R	R	R	R	R	R	R	R	R	R	R		R			R			R
2.50																														
2.00						T		P		R		R	R	R	R	R	R	R	R	R	R	R		R			R			R
1.50					T	T		H		H		H	H	H	H	H	H	H	H	H	H	H		H			H			H
1.25																														
1.00			T		T	H		H		H		H	H	H	H	H	H	H	H	H	H	H		H			H			H
0.75		T	T		T	H		H		H		H	H	H	H	H	H	H	H	H	H	H		H			H			H
0.50	T	T	T		T	H		H		H		H	H	H	H	H	H	H	H	H	H	H		H			H			H

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B41K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	3	4	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	6	6	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	51
PIP	PIPE	8	8	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	10	10	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	12	12	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	14	14	7.92	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	16	18	9.53	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
PIP	PIPE	20	20	40S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	22	22	9.53	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	24	24	80S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	26	26	11.0	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	30	30	12.7	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	36	36	15.0	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
PIP	PIPE	42	42	17.5	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	113
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z4	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z4	
FLG	FLNG.WN	26	42	M	B-16.47-B	ASTM A 182 GR.F304	300, RF/125AARH	FWB4147Z4	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z4	

Package : IPMCS
Report No. : 50

B41K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Flange Group									
FLB	FLNG.BLIND	26	42		B-16.47-B	ASTM A 182 GR.F304	300, RF/125AARH	FBB4147Z4	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z4	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z4	
FEF	SPCR&BLND	26	42		EIL'STD	ASTM A 240 GR.304	300, FF/125AARH	FCE9141Z4	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z4	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z14	
ELB90	ELBOW.90	10	42	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z14	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z4	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z14	
ELB45	ELBOW.45	10	42	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z14	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z4	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ4	
TEQ	T.EQUAL	10	42	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ4	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z4	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ4	
TRED	T.RED	10	42	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ4	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ4	
REDC	REDUC.CONC	10	42	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ4	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ4	
REDE	REDUC.ECC	10	42	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ4	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ4	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ4	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B41K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	2	42	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ4	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z4	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z4	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z4	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z4	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 510AL	510ALZZZ4	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514AL	514ALZZZ4	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 520AL	520ALZZZ4	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524AL	524ALZZZ4	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530AL	530ALZZZ4	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534AL	534ALZZZ4	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SEAT-PCTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544AL	544ALZZZ4	
Bolt Group									
BOS	BOLT.STUD	.5	42		B-18.2	BOLT:A320 GR.B8CL.2, NUT:A194 GR.8		BS41809Z4	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 300	GK66474Z4	
GAS	GASKET	26	42		B-16.20-ANSI B16.47B	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 300	GK56474Z4	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42A** Sheet 1 of 5

PIPE CLASS : **B42A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	48.86	48.86	46.4	45.72	44.99	43.23

SERVICE

CLEAN HYDROCARBONS (MIXTURE EHYLENE/BUTENE)
AT LOW TEMPERATURE (OR RISK OF LOW TEMP)
- 45°C MINIMUM , LIQUID BUTENE

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

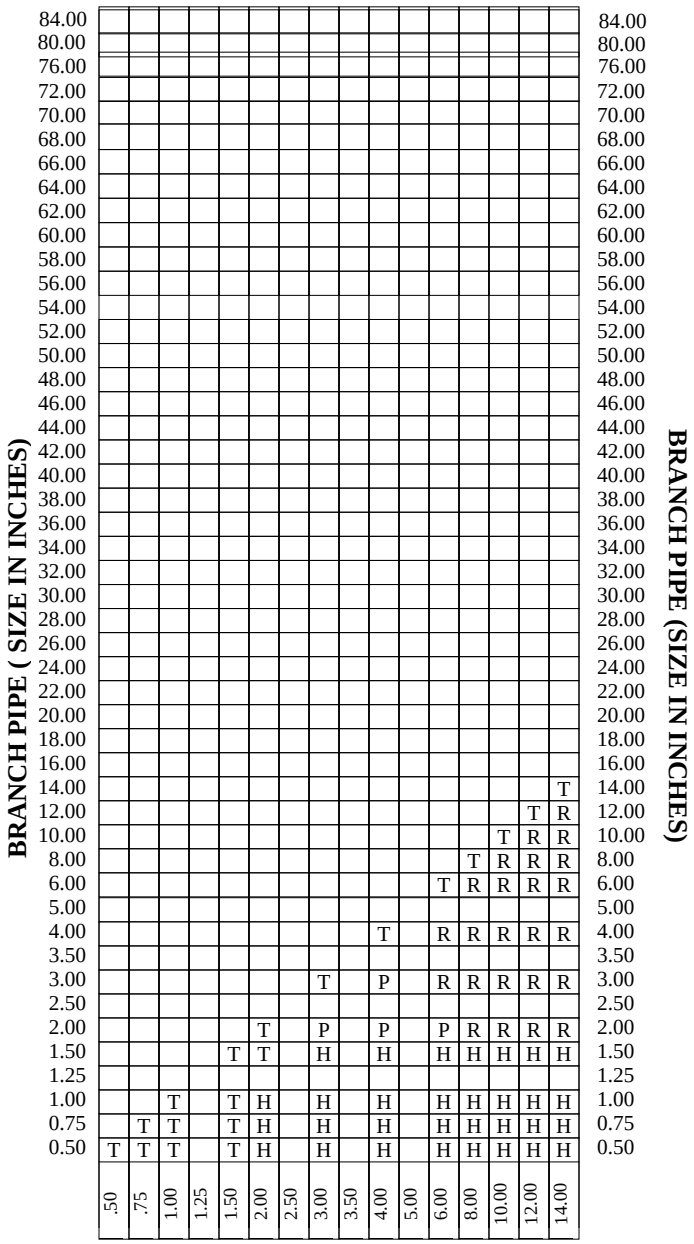
602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B42A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z5	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51403	51403ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-	FLGD, 300, B-16.5, RF/125AARH, SHT	52403ZZZ5	

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Location BINA, MADHYA PRADESH	**Pipe Class :B42A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-SS 316	NO.- 52403		
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53403	53403ZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT :RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544BE	544BEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 300,FF/125AARH	ST17539Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42K** Sheet 1 of 6

PIPE CLASS : **B42K**
RATING : 300
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-110	-101	38	93	149	180	204	260	316	343
PRESS	49.9	50.6	50.6	42.2	38	36.2	34.8	32.6	30.9	30.2

SERVICE

HYDROCARBONS-LIQUID / VAPOR; LOW TEMPERATURE AND HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASSES - LGP45 & L6E57)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

724 VALVE FIRE TESTED TO API 607

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

737 GROOVED METAL SS316L(UNS S31603); FLEXIBLE GRAPHITE; GROOVED FLAT PROFILE METALLIC CORE(4 MM) WITH SOFT GASKET SEALING MATERIAL ON EITHER FACE(0.50 MM EACH). LOOSE LOCATING RING, SS316L(UNS S31603); TO BE USED IF SPECIFIED IN PROCESS DESIGN PACKAGE/ P&ID: DON'T APPLY LUBRICANT OR ANTI-SEIZE COMPOUND

741 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.75" : STR-419 & 1" TO 12": STR-409 IS TO BE FOLLOWED.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

744 FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

745 CAST; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 4, GEAR LARGER SIZES

746 CAST; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

747 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; SWING TYPE; BONNETLESS; API TRIM # 12 / 12A

748 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH

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GRAPHITE; API TRIM #10

749 VALVE; CHECK; API 594; TAPPED LUG OR DOUBLE FLG; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; DUAL-PLATE WAFER-LUG STYLE; 316 STAINLESS STEEL STEM; API TRIM #10; 316 STAINLESS STEEL DISC; SPRING: INCONEL-X; ASME B16.5/B16.47 SERIES A

750 BUTT WELDING X NPTF; STAINLESS STEEL; ASTM A 182 GR F 316L; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #12/12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

751 CAST; REDUCED PORT TYPE; TOP ENTRY; EXTENDED BONNET, BOLTING: ASTM A193 GR B8; GASKET: GRAPHITE/METAL/METAL WITH GRAPHITE; 316 STAINLESS STEEL STEM & BALL; SEATING: GRAPHITE; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); EXTERNAL BALL STOP (INTERNAL WELD) TO BE SUPPLIED; OPERATOR: LEVER

753 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL.

888 PICKLED & PASSIVATED.

895 SHALL BE USED ONLY FOR LICENSOR SPECIFICATION LGP45

897 THIS VALVE SHALL BE USED AS PRIMARY PREFERENCE ONLY IN SIZES 8" TO 12" FOR LICENSOR SPECIFICATION L6E57. FOR LICENSOR SPECIFICATON LGP45 AND FOR SIZES 4" TO 6" IN L6E57, THIS VALVE SHALL BE USED ONLY IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE/ P&ID.

898 FOR USAGE OF VALVES IN AREAS SUBJECTED TO CHLORIDE STRESS CRACKING CONSIDERATIONS, REQUIREMENTS SPECIFIED IN THE LICENSOR SPECIFICATION LGP45 SHALL BE CONSIDERED.

899 ASME B16.34/16.10 LONG PATTERN; FULL PORT TYPE; BOLTING: ASTM A 193 GR B8; SS316 STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL.

912 LICENSOR PMS LGP45 & L6E57 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

970 SHALL BE USED ONLY FOR LICENSOR SPECIFICATION L6E57.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

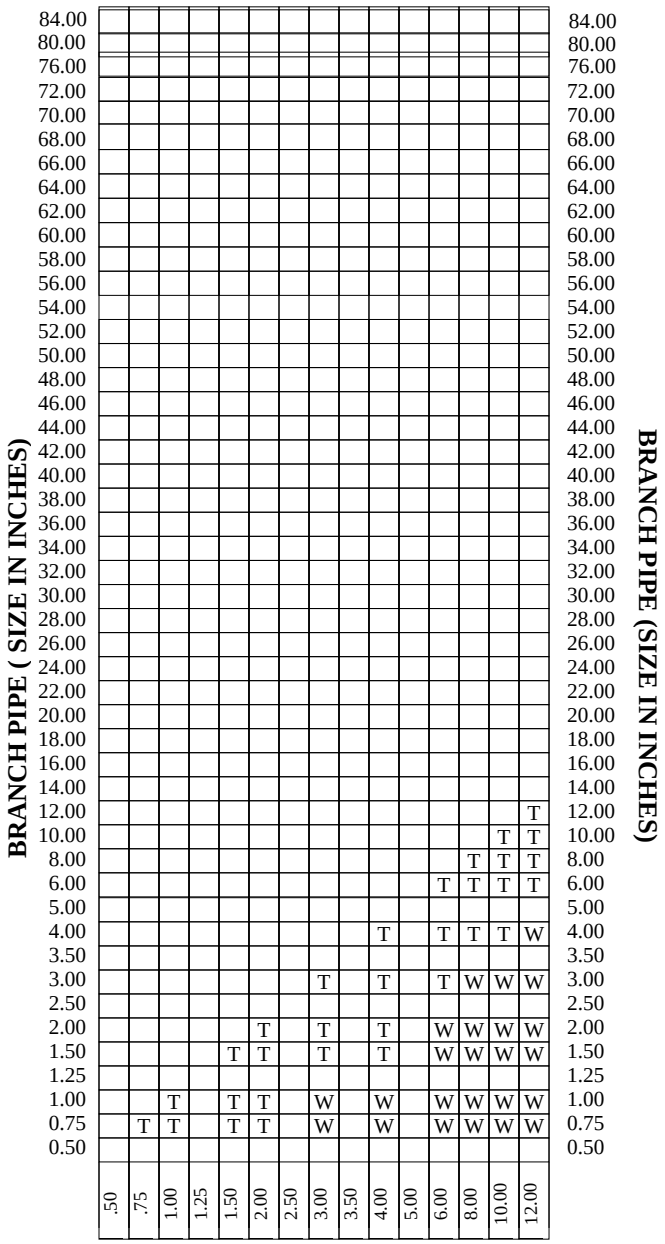
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-912,28	
	ON LINES >= 2.0"	NOTE-912,28	
VENTS	ON LINES <= 1.5"	NOTE-912,28	
	ON LINES >= 2.0"	NOTE-912,28	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-912)	
PRESS.CONN	0.75"	NOTE-912,28	

Package : IPMCS

Report No. : 50

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B42K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	2	8	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	10	12	40S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z4	888
Flange Group									
FLG	FLNG.WN	.75	12	M	B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FWCD847Z4	
FLB	FLNG.BLIND	.75	12		B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FBCD847Z4	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F304/304L	300, FF/125AARH	FGKD841Z4	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 182 GR.F304/304L	300, FF/125AARH	FCKD841Z4	
Fitting Group									
ELB90	ELBOW.90	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z14	
ELB90	ELBOW.90	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z14	
ELB45	ELBOW.45	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z14	
ELB45	ELBOW.45	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z14	
TEQ	T.EQUAL	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ4	
TEQ	T.EQUAL	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ4	
TRED	T.RED	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ4	
TRED	T.RED	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ4	
REDC	REDUC.CONC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ4	
REDC	REDUC.CONC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ4	
REDE	REDUC.ECC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ4	
REDE	REDUC.ECC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-	BW	WVGU84ZZ4	

Package : IPMCS
Report No. : 50

B42K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
						WX			
CAP	CAP	.75	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ4	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z4	307
O'let Group									
WLT	WELDOLET	.75	6	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ4	
Valves Group									
GAV	VLV.GATE	.75	.75		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514QM	514QMZZZ4	745,12,742,743,895,898
GAV	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 510QM	510QMZZZ4	744,12,742,743,970
GAV	VLV.GATE	1	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514QM	514QMZZZ4	745,12,742,743,898
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510VM	510VMZZZ4	750,12,742,728
GLV	VLV.GLOBE	.75	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524QM	524QMZZZ4	746,12,742,743,898
CHV	VLV.CHECK	.75	.75		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534QM	534QMZZZ4	748,742,743,895,898
CHV	VLV.CHECK	.75	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 530QM	530QMZZZ4	747,742,970
CHV	VLV.CHECK	1	6		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534QM	534QMZZZ4	748,742,743,898
CHV	VLV.CHECK	8	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534QM	534QMZZZ4	748,742,743,895,898
CHV/1	VLV.CHECK	2	12		API-594	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	WAFL, 300, B-16.5, WAF/125AARH, SHT NO.- 534TM	534TMZZZ4	749,705,742,897
BLV	VLV.BALL	.75	6		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544QM	544QMZZZ4	751,12,742,743,753,970
BLV/1	VLV.BALL	.75	6		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544TM	544TMZZZ4	899,12,720,724,742,743,895,898

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B42K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.75	12		B-18.2	BOLT:A193 GR.B8M CL.2(PTFE COATED), NUT:A194 GR.8MA(PTFE COATED)		BS45039Z4	988
Gasket Group									
GAS	GASKET	.75	12		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 300	GK69774Z4	731
GAS/300	GASKET	.75	12		B-16.20-ANSI B16.5	SS 316L	RING, 300, 5 MM	GK67554Z4	737

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43A** Sheet 1 of 5

PIPE CLASS : **B43A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	48.86	48.86	46.4	45.72	44.99	43.23

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY) AT LOW TEMPERATURE
(OR RISK OF LOW TEMP) - 45°C MINIMUM

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

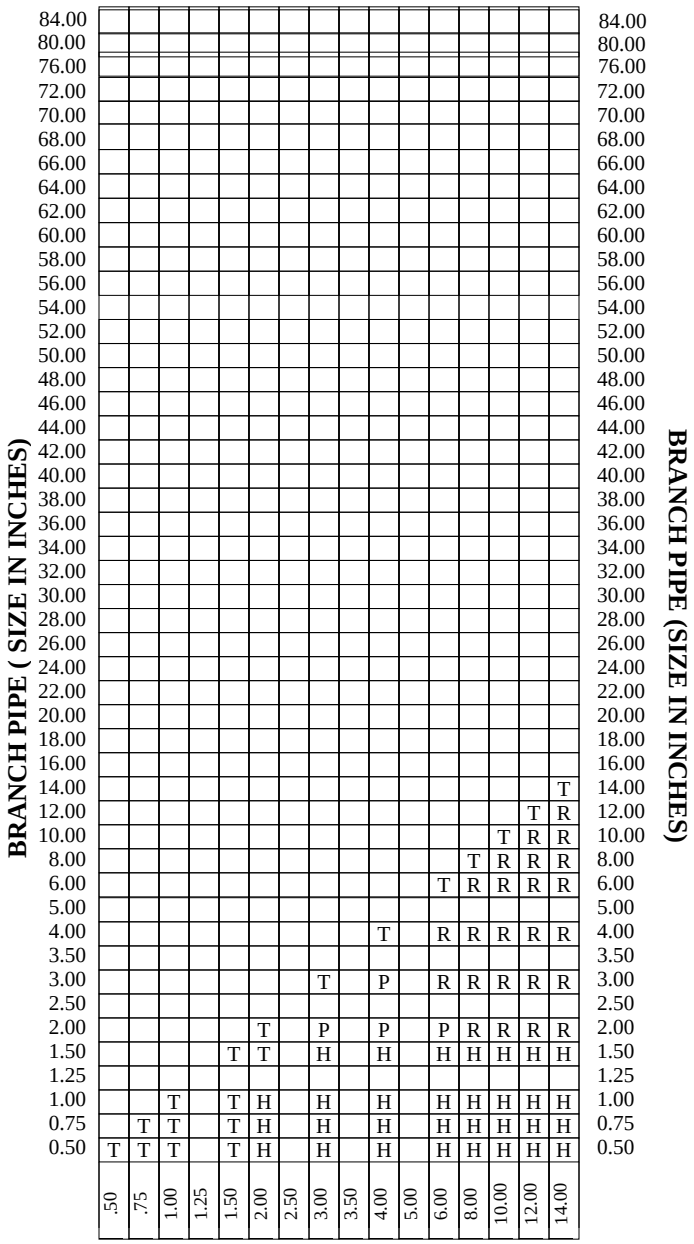
603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B43A

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B43A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :B43A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DE	514DEZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DD	514DDZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DE	524DEZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DD	524DDZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DE	534DEZZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DD	534DDZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT : RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544DE	544DEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 300,FF/125AARH	ST17539Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 1 of 6

PIPE CLASS : **B43K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-110	38	93	149	204	260	316	343
PRESS	49.91	49.91	43.59	37.37	36.2	33.74	31.63	31.28

SERVICE

HYDROCARBONS:LOW TEMPERATURE & HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASS - 6E57)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

329 USE FOR ONLY 3/4"X1/2" SCRD GLOBE VALVE (GLV/1) TO BE USED FOR VENTS, DRAINS AND INSTRUMENT CONNECTION.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

539 A THREADED OLET IS REQUIRED TO INSTALL THIS VALVE. SEAL WELD AT THE OLET; FOLLOW VALVE MANUFACTURER'S GUIDELINES.

576 USE FOR ONLY 3/4" X 1/2" SW GLOBE VALVE (GLV/3) TO BE USED FOR VENT, DRAINS AND INSTRUMENT CONNECTION.

623 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 6E57

657 REFER LICENSOR SPECIFICATION FOR STR-409 FOR STRAINERS.

658 REFER LICENSOR SPECIFICATION FOR STR-419 FOR STRAINERS.

663 GRAFOIL GTB OR GTK FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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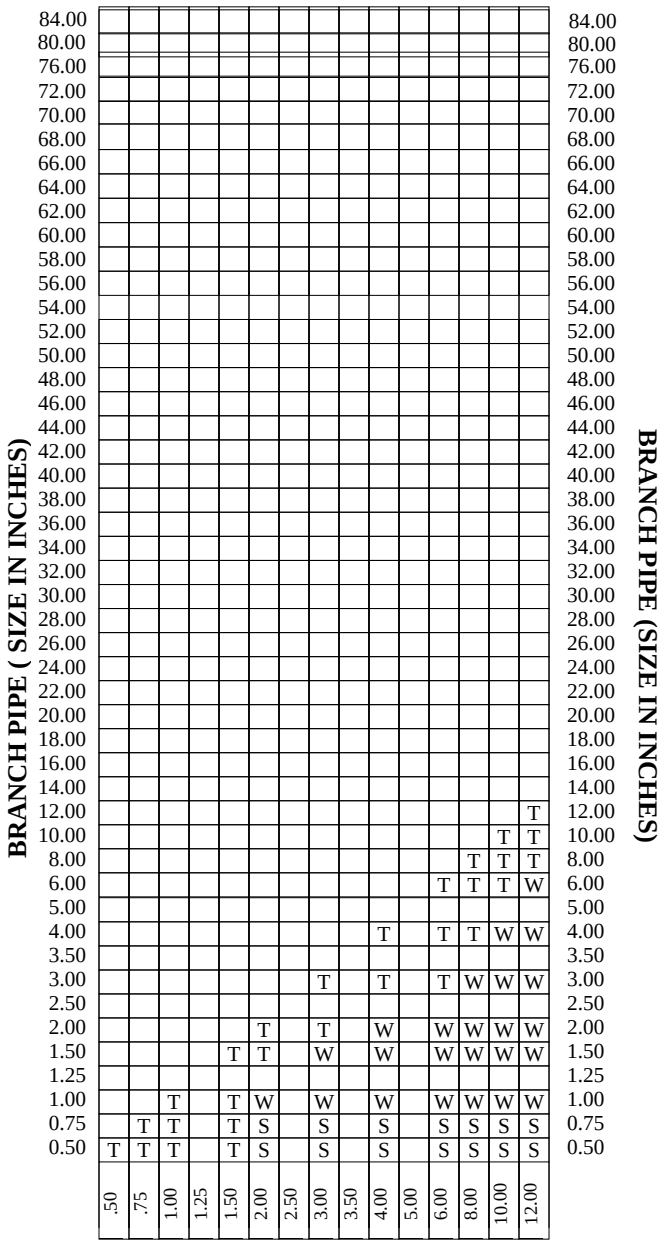
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SW COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER EIL STD 7-44-0350, DP10	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER EIL STD 7-44-0351, DP10	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER EIL STD 7-44-0350, VP10	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER EIL STD 7-44-0351, VP10	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SCRD GLOBE VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 3 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B43K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	2	8	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	10	12	40S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	
Flange Group									
FLG	FLNG.SW	.5	.75	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FSC4447Z4	
FLG	FLNG.WN	1	12	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FWC4447Z4	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FBC4447Z4	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316	300, FF/125AARH	FGK4441Z4	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 182 GR.F316	300, FF/125AARH	FCK4441Z4	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z4	
ELB90	ELBOW.90	1	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z14	
ELB90	ELBOW.90	10	12	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z14	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z4	
ELB45	ELBOW.45	1	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z14	
ELB45	ELBOW.45	10	12	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z14	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z4	
TEQ	T.EQUAL	1	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ4	
TEQ	T.EQUAL	10	12	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ4	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z4	
TRED	T.RED	1	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ4	
TRED	T.RED	10	12	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ4	
REDC	REDUC.CONC	1	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ4	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	10	12	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ4	
REDE	REDUC.ECC	1	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ4	
REDE	REDUC.ECC	10	12	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ4	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ4	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ4	
CAP	CAP	.5	.75		B-16.11	ASTM A 182 GR.F304	SCRF, 6000	WF64283Z4	422
CAP	CAP	1	12	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ4	
PLG	PLUG	.5	.75		B-16.11	ASTM A 182 GR.F304	SCRM, 3000	WH64292Z4	307
CPLF	CPLNG.FULL	.5	1		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z4	
CPLH	CPLNG.HALF	.5	1		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z4	
CPLL	CPLNG.LH	.5	1		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z4	
CPLR	CPLNG.RED	.5	1		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z4	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 182 GR.F304	SW, 3000	YSS42D2Z4	
WLT	WELDOLET	1	12	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YWS424ZZ4	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YES424ZZ4	311
TLT	THREADOLET	.75	.75		MSS-SP97	ASTM A 182 GR.F304	SCRF, 3000	YTS4282Z4	329
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YLS424ZZ4	311
Valves Group									
GAV	VLV.GATE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS316, SEATS HARDFACED	SW, 800, 3000, B-16.11, SHT NO.-510LM	510LMZZZ4	623
GAV	VLV.GATE	1	12		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514LM	514LMZZZ4	623
GAV/1	VLV.GATE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS316, SEATS HARDFACED	SW, 800, 3000, B-16.11, SHT NO.-510CM	510CMZZZ4	623

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B43K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	1	12		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524LM	524LMZZZ4	623
GLV/3	VLV.GLOBE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS316	SW, 800, 3000, B-16.11, SHT NO.- 520VL	520VLZZZ4	576,623
GLV/1	VLV.GLOBE	.75	.75		BS EN ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 520LM	520LMZZZ4	312,623
CHV	VLV.CHECK	.5	.75		API 602/ ISO 15761	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 530LM	530LMZZZ4	623
CHV	VLV.CHECK	1	2		BS-1868	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534LM	534LMZZZ4	623
CHV	VLV.CHECK	3	12		API-594	BODY-ASTM A 351 GR.CF8M,TRIM-13%CR.STEEL, SEATS-HARDFACED	WAFL, 300, B-16.5, RF/125AARH, SHT NO.- 534DM	534DMZZZ4	623
BLV	VLV.BALL	1	12		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,BALL+SEAT - SS316+CR2C3	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544LM	544LMZZZ4	623
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B8MCL.2, NUT:A194 GR.8M		BS41212Z4	
Gasket Group									
GAS	GASKET	.5	12		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z4	663
Trap/Strainer Group									
PSR	STRNR.PERM	.5	.75		MNF'STD	B:A182GR.F316;INT:SS316	SW, Y-TYPE, 800	SP308D514	658
PSR	STRNR.PERM	1	10		MNF'STD	B:A351GR.CF8M;INT:SS316	FLGD, Y-TYPE, 300,RF/125AARH, SMGR/MAX125AARH	SP3A155B4	657

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44A** Sheet 1 of 5

PIPE CLASS : **B44A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

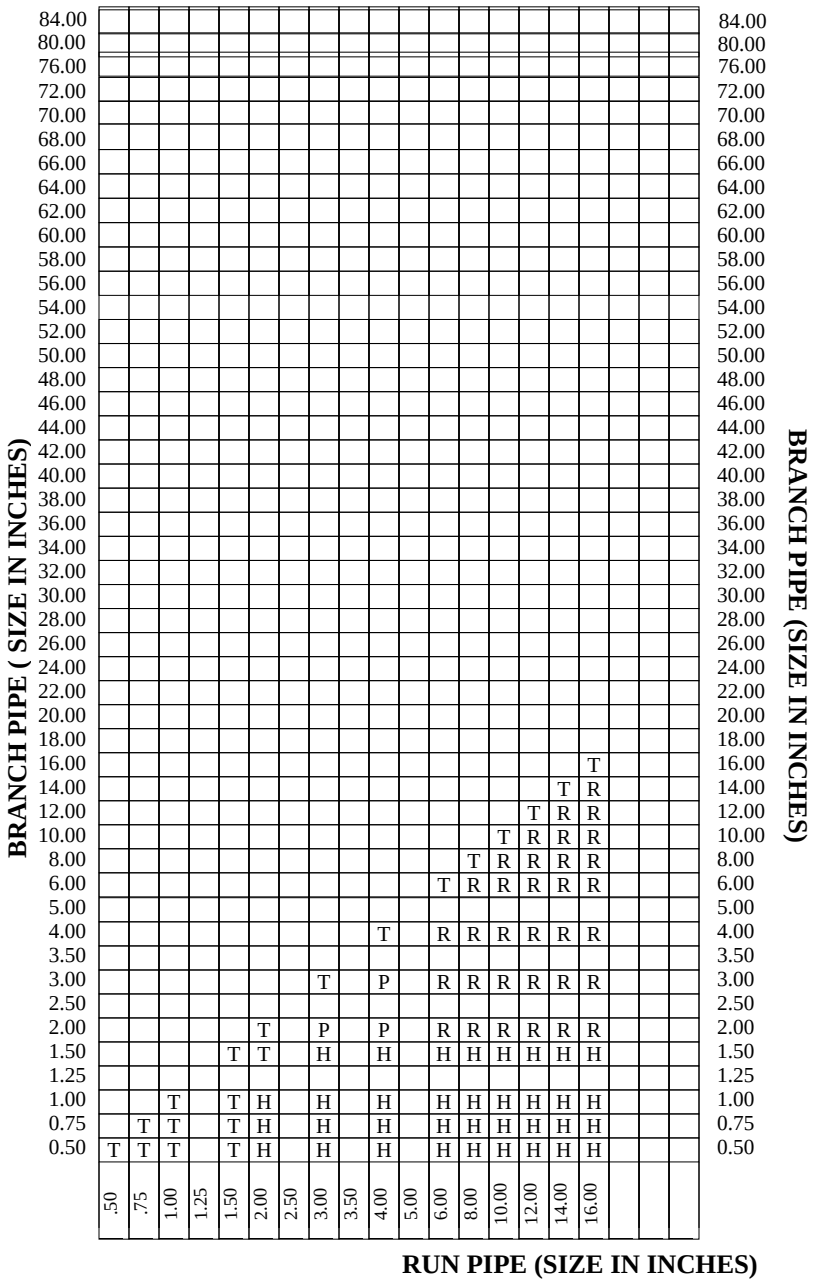
603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B44A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z5	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z5	
FLG	FLNG.WN	2	16	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z5	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z5	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z15	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z15	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z5	

Package : IPMCS
Report No. : 50

B44A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ5	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z5	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z5	
CAP	CAP	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CE	514CEZZZ5	
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CB	514CBZZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CE	524CEZZZ5	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CB	524CBZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CE	534CEZZZ5	
CHV	VLV.CHECK	2	16		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CB	534CBZZZ5	
BLV	VLV.BALL	.5	20		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT :RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544CE	544CEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z5	
Gasket Group									
GAS	GASKET	.5	16		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 300,RF/125AARH	TR30655B5	
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44K** Sheet 1 of 5

PIPE CLASS : **B44K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454
PRESS	50.5	50.5	42.18	37.96	34.8	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE

DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

48 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE A453 GR.660 CL.A

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

180 100% RADIOGRAPHY SHALL BE DONE FOR ALL BUTT WELD JOINTS.

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

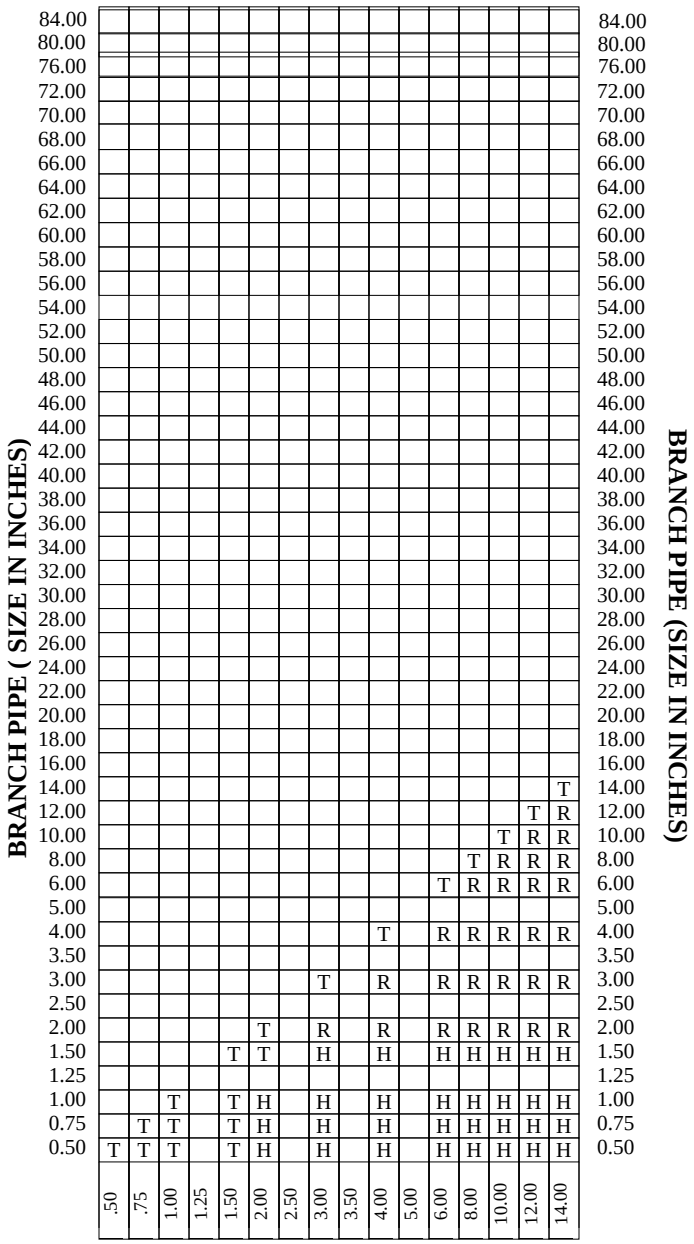
659 ONLY PIPING IS STAINLESS STEEL, VALVES REMAIN IDENTICAL TO PIPING CLASS B44A.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGE VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44K** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B44K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	3	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	4	6	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	8	8	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	10	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	32
PIP	PIPE	12	12	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	14	14	40S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CE	514CEZZZ0	
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CB	514CBZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-	FLGD, 300, B-16.5, RF/125AARH, SHT	524CEZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B44K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-13%CR.STEEL	NO.- 524CE		
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CB	524CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CE	534CEZZZ0	
CHV	VLV.CHECK	2	16		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CB	534CBZZZ0	
BLV	VLV.BALL	.5	20		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT :RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544CE	544CEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	48
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 300,FF/125AARH	ST14139Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	14	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45A** Sheet 1 of 5

PIPE CLASS : **B45A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

HC SLURRY (POLYMER + CATALYST):- PUMPAROUND, EFFLUENT, EVAPORATION LINES

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

604 STRAIGHT PIPE RUN SHALL HAVE BREAK UP FLANGES AT EACH 3 METER.

605 PIPE BENDS SHALL HAVE FLANGED ENDS.

606 FOR VALVES USED IN POLYMER SERVICE, METAL SEAT SHALL BE USED (NO TEFLON SEAT).

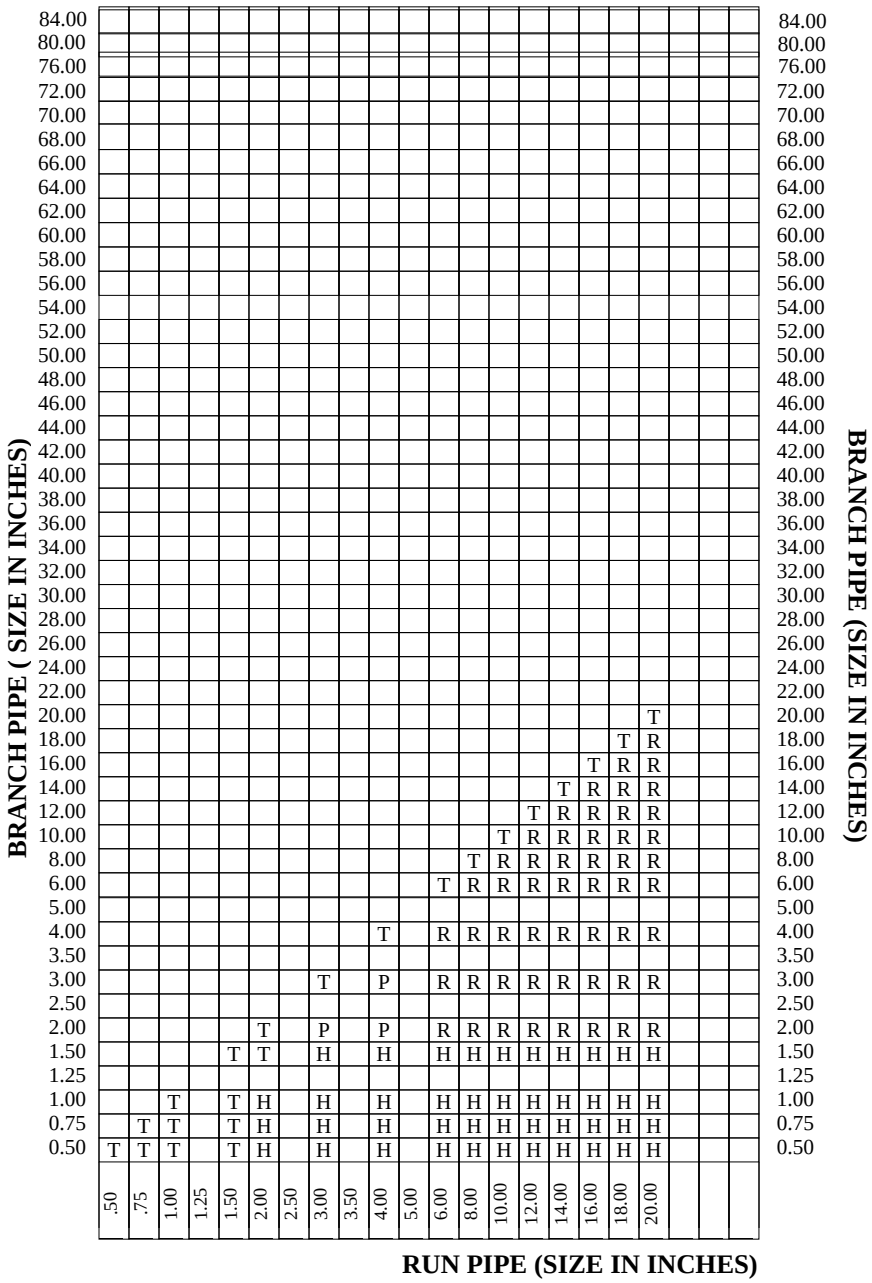
608 THE SPECIAL FLANGES ARE PAD FLANGES TO EIL STD 7-12-0014.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B45A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	20	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	20	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	20		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	20		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
FLP	FLNG.SPCL	1	16		EIL'STD	ASTM A 105	300, RF/125AARH	FUE0147Z0	608
Fitting Group									
BND	PIPE.BEND	.5	1.5	M	ASME B31.3	ASTM A 105	PE, 3D	WCI0273Z0	605
BND	PIPE.BEND	2	14	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 3D	WCI6843Z0	605
BND	PIPE.BEND	16	20	M	ASME B31.3	ASTM A 234 GR.WPB-W	BW, 3D	WCI7543Z0	605
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	20	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	

Package : IPMCS
Report No. : 50

B45A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	20	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	20	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	20	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	
CAP	CAP	1	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	20	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CE	514CEZZZ0	
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CB	514CBZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CE	524CEZZZ0	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CB	524CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CE	534CEZZZ0	
CHV	VLV.CHECK	2	16		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CB	534CBZZZ0	
BLV	VLV.BALL	.5	20		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT SS-316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544EE	544EEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	20		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	20		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 300,RF/125AARH	TR30655B0	
TSR	STRNR.TEMP	1.5	20		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	20	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45K** Sheet 1 of 5

PIPE CLASS : **B45K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454
PRESS	50.5	50.5	42.18	37.96	34.8	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE

SPENT CATALYST, HC SLURRY

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

48 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE A453 GR.660 CL.A

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

606 FOR VALVES USED IN POLYMER SERVICE, METAL SEAT SHALL BE USED (NO TEFLON SEAT).

608 THE SPECIAL FLANGES ARE PAD FLANGES TO EIL STD 7-12-0014.

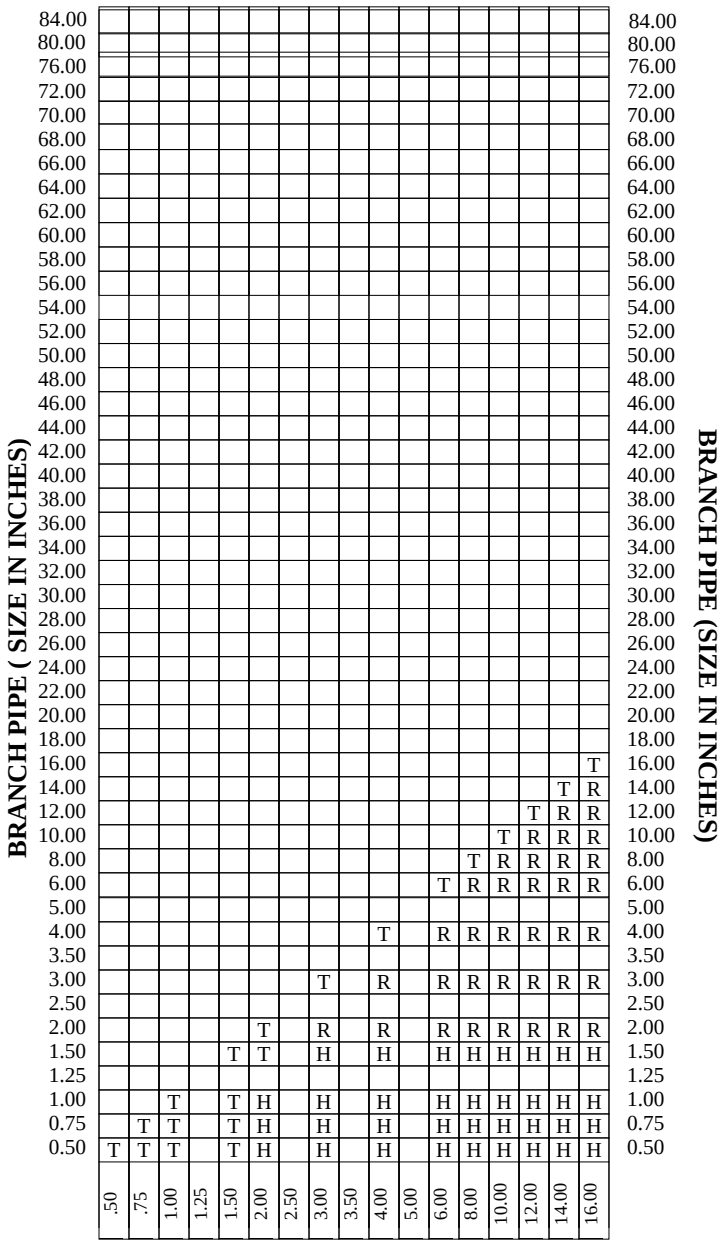
660 ONLY PIPING IS STAINLESS STEEL, VALVES REMAIN IDENTICAL TO PIPING CLASS B45A.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45K** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B45K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	3	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	4	6	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	8	8	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	10	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	32
PIP	PIPE	12	12	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	14	14	40S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CE	514CEZZZ0	
GAV	VLV.GATE	2	16		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514CB	514CBZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CE	524CEZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B45K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524CB	524CBZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CE	534CEZZZ0	
CHV	VLV.CHECK	2	16		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL,SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534CB	534CBZZZ0	
BLV	VLV.BALL	.5	20		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT SS-316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544EE	544EEZZZ0	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	48
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 300,FF/125AARH	ST14139Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	14	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B46A** Sheet 1 of 5

PIPE CLASS : **B46A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	48.86	48.86	46.4	45.72	44.99	43.23

SERVICE

HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE
(OR RISK OF LOW TEMPERATURE) -45°C MINIMUM
PUMPAROUND, EFFLUENT, EVAPORATION LINES

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

603 VALVES SHALL HAVE FLANGED ENDS IN ALL SIZES.

604 STRAIGHT PIPE RUN SHALL HAVE BREAK UP FLANGES AT EACH 3 METER.

605 PIPE BENDS SHALL HAVE FLANGED ENDS.

606 FOR VALVES USED IN POLYMER SERVICE, METAL SEAT SHALL BE USED (NO TEFLON SEAT).

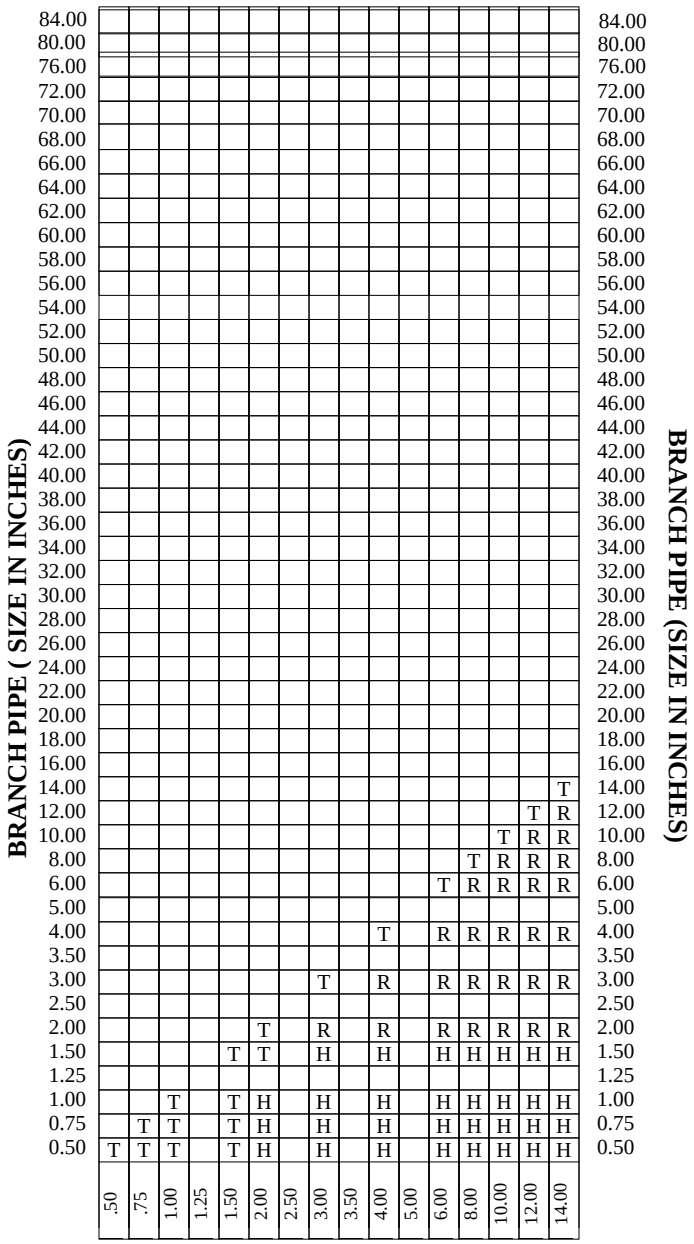
608 THE SPECIAL FLANGES ARE PAD FLANGES TO EIL STD 7-12-0014.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	FLANGED VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B46A

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B46A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
Fitting Group									
BND	PIPE.BEND	.5	1.5	M	ASME B31.3	ASTM A 350 GR.LF2 CL.1	PE, 3D	WCIT773Z5	605
BND	PIPE.BEND	2	14	M	ASME B31.3	ASTM A 420 GR.WPL6	BW, 3D	WCIB443Z5	605
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DE	514DEZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DD	514DDZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DE	524DEZZZ5	
GLV	VLV.GLOBE	2	14		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DD	524DDZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DE	534DEZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DD	534DDZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT SS-316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544FE	544FEZZZ5	601

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B46A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 300,FF/125AARH	ST17539Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :B46K** Sheet 1 of 5

PIPE CLASS : **B46K**
RATING : 300
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-46	38	93	149	204
PRESS	50.6	50.6	40.1	26.7	10.5

SERVICE

PRODUCT DISCHARGE (BASED ON LICENSOR PMS CLASS - LGP44)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

319 PROVIDE WELDED GROUNDING CLIPS AT FLANGED EQUIPMENT AND ON BOTH SIDES OF FLANGED JOINTS.

549 RUN AN ELECTRICAL CONTINUITY TEST EACH TIME THE PIPEWORK IS ASSEMBLED, AND AT LEAST ONCE A YEAR.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

732 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS
ENGINEER PER ASME B31.3 PARAGRAPH 301.5.4. (CONT.)

733 (CONT. FROM NOTE NO. 732) IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED

734 PIPE BETWEEN THE REACTOR AND THE PRODUCT CHAMBER TO BE SUBJECTED TO FATIGUE ANALYSIS IN ADDITION TO THERMAL ANALYSIS TO DETERMINE IF A THICKNESS ABOVE THAT LISTED FOR PRESSURE IS REQUIRED.

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

772 BUTT WELDING X NPTF; STAINLESS STEEL; ASTM A 182 GR F 316L; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

773 FOR PIPING SYSTEMS SUBJECT TO VIBRATION, BRACING OF PERMANENT VENTS AND DRAINS SHOULD BE

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CONSIDERED

886 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL WELD SPLATTER SHALL BE REMOVED. GTAW SHALL BE USED FOR THE ROOT PASS OF ALL WELDS.(CONT.)

887 (CONT. FROM NOTE NO.886) ROOT PENETRATION SHALL BE KEPT AT A MINIMUM. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE-CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

888 PICKLED & PASSIVATED.

899 ASME B16.34/16.10 LONG PATTERN; FULL PORT TYPE; BOLTING: ASTM A 193 GR B8; SS316 STEM & BALL; SEATING: MOLECULARLY ENHANCED PTFE; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL.

942 LICENSOR PMS LGP44 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

944 FOR BRANCH OUTLET CONNECTIONS BETWEEN 45 AND 90 DEGREES, FABRICATE FROM PIPE USING ¿SET IN¿ CONSTRUCTION [SEE ASME B31.3 FIGURE 328.5.4D (2) OR (4)]. CHECK THE BRANCH OUTLET CONNECTION IN ACCORDANCE WITH ASME B31.3 AREA REPLACEMENT RULES.

945 USE HEAVIER PIPE WHEN REINFORCEMENT IS REQUIRED TO AVOID THE USE OF A REINFORCING PAD. ALL FILLET WELDS MUST BE SMOOTH IN CONTOUR AS WELL, BLEND GROUND IF NECESSARY.

946 VALVES ON THIS SPECIFICATION SHALL MEET THE REQUIREMENTS OF THE APPLICABLE INDUSTRY STANDARDS LISTED.
ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

947 FOR USAGE OF VALVES IN AREAS SUBJECTED TO CHLORIDE STRESS CRACKING CONSIDERATIONS, REQUIREMENTS SPECIFIED IN THE LICENSOR SPECIFICATION LGP44 SHALL BE CONSIDERED.

949 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: INTEGRAL; 316 STAINLESS STEEL TRIM; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL.

950 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: INTEGRAL; 316 STAINLESS STEEL TRIM; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL.

951 1000 PSI; CAST; 3-PIECE BODY; BOLTING:ASTM A193 GR B7 W/ASTM A194 GR 2H FINISHED NUTS; REINFORCED OR MOLECULARLY ENHANCED PTFE SEATING; SS316 BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); OPERATOR: LEVER; WELD-IN BODY CAPS SHALL BE ASTM A82 GR F316L, A479 TYPE 316L OR A351 GR CF3M.

955 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE ONLY, IF MENTIONED IN PROCESS DESIGN PACKAGE OR P&ID.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

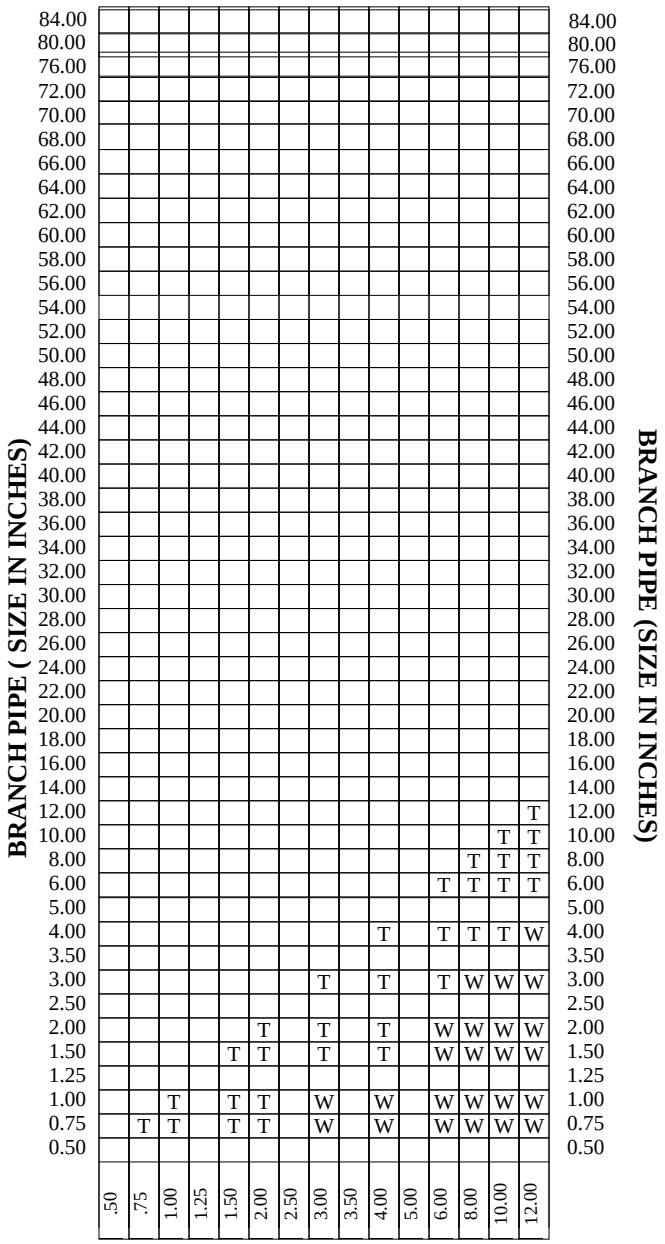
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-942,28	
	ON LINES >= 2.0"	NOTE-942,28	
VENTS	ON LINES <= 1.5"	NOTE-942,28	
	ON LINES >= 2.0"	NOTE-942,28	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-942)	
PRESS.CONN	0.75"	NOTE-942,28	

Package : IPMCS

Report No. : 50

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B46K** Sheet 3 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B46K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B46K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	3	4	10S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	6	8	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
PIP	PIPE	10	12	40S	B-36.19	ASTM A358 TP304/304L CL.1	BE, E.FS.W	PI3O813Z4	888
NIP/	NIPPLE	.75	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z4	
Flange Group									
FLG	FLNG.WN	.5	12	M	B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FWCD847Z4	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 182 GR.F304/304L	300, RF/125AARH	FBCD847Z4	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304/304L	300, FF/125AARH	FGKD841Z4	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 182 GR.F304/304L	300, FF/125AARH	FCKD841Z4	
Fitting Group									
ELB90	ELBOW.90	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z14	
ELB90	ELBOW.90	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z14	
ELB45	ELBOW.45	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z14	
ELB45	ELBOW.45	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z14	
TEQ	T.EQUAL	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ4	
TEQ	T.EQUAL	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ4	
TRED	T.RED	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ4	
TRED	T.RED	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ4	
REDC	REDUC.CONC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ4	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B46K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ4	
REDE	REDUC.ECC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ4	
REDE	REDUC.ECC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ4	
CAP	CAP	.75	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ4	
O'let Group									
WLT	WELDOLET	.75	10	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ4	
Valves Group									
GAV	VLV.GATE	.75	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514QN	514QNZZZ4	949,12,743,946,947
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510QN	510QNZZZ4	772,12,728,946
GLV	VLV.GLOBE	.75	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524QN	524QNZZZ4	950,12,743,946,947
BLV	VLV.BALL	.75	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544QN	544QNZZZ4	899,12,720,724,743,946,947
BLV/1	VLV.BALL	.75	.75		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 544RN	544RNZZZ4	951,12,720,721,724,725,728,946,955
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z4	988
Gasket Group									
GAS	GASKET	.5	12		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 300	GK69774Z4	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 1 of 7

PIPE CLASS : **B47A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-46	38	93	149	204	260
PRESS	50.62	50.62	43.59	39.37	36.2	33.74

SERVICE

HYDROCARBONS, HP NITROGEN, RECOVERED GAS (BASED ON LICENSOR PMS CLASS - 2E63 & 2E18).

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

123 PIPING WITH THICKNESS>12.7 SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

501 SOFT SEATED CHECK VALVE. USE WHEREVER POSSIBLE. METAL SEATED CHECK VALVE (CK 1113A) SHOULD BE USED WHEN THERE IS NO ALTERNATIVE.

502 FOR 2" & ABOVE " BLOCK AND BLEED" SERVICE, USE GA 902C FOR NORMAL NON-HAZARDOUS SERVICE AND GA 1602 FOR CRITICAL BLOCK AND BLEED SERVICE.

621 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 2E63

657 REFER LICENSOR SPECIFICATION FOR STR-409 FOR STRAINERS.

667 PTFE FILLER; CONDREN STYLE 913 OR EQUAL.

670 NOT TO BE USED BELOW -29 DEGREE CELSIUS.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

979 FOR 2" AND ABOVE "BLOCK AND BLEED" SERVICE FOR NORMAL NON-HAZARDOUS SERVICE

980 FOR 2" AND ABOVE "BLOCK AND BLEED" SERVICE FOR CRITICAL BLOCK AND BLEED SERVICE.

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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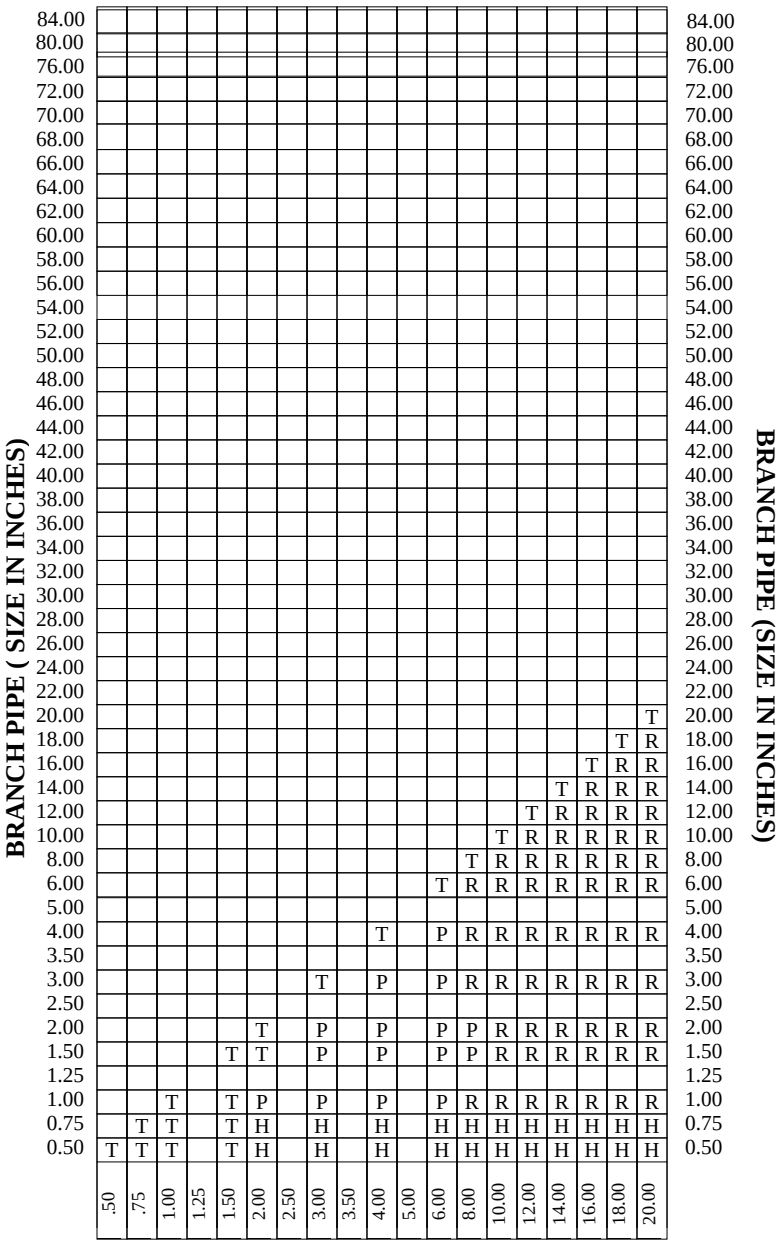
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SW COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EILSTD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EILSTD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EILSTD 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EILSTD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD GATE VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B47A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z5	
PIP	PIPE	1	1	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z5	
PIP	PIPE	1.5	1.5	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	18	20	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
Flange Group									
FLG	FLNG.SW	.5	.75	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FSC4447Z5	
FLG	FLNG.WN	1	1	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FWC4447Z5	
FLG	FLNG.WN	1.5	20	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	1		B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FBC4447Z5	
FLB	FLNG.BLIND	1.5	20		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	1		ASME-B16.48	ASTM A 182 GR.F316	300, FF/125AARH	FGK4441Z5	
FEF	FLNG.FIG.8	1.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	20		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z5	
ELB90	ELBOW.90	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z15	
ELB90	ELBOW.90	1.5	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	20	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z5	
ELB45	ELBOW.45	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z15	
ELB45	ELBOW.45	1.5	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	

Package : IPMCS
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B47A

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	20	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
BND	PIPE.BEND	.5	.75	M	ASME B31.3	ASTM A 403 GR.WP304-S	PE, 3D	WCI8773Z5	
BND	PIPE.BEND	1	1	M	ASME B31.3	ASTM A 403 GR.WP304-S	BW, 3D	WCI8743Z5	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z5	
TEQ	T.EQUAL	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ5	
TEQ	T.EQUAL	1.5	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	20	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z5	
TRED	T.RED	1	1	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ5	
TRED	T.RED	1.5	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	20	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	1.5	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	20	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	1.5	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	20	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	1	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ5	
SWGE	SWAGE.ECC	.5	1	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ5	
CAP	CAP	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ5	
CAP	CAP	1.5	20	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
PLG	PLUG	.5	.75		B-16.11	ASTM A 182 GR.F304	SCRM, 3000	WH64292Z5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z5	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 350 GR.LF2 CL.1	BW	YEST74ZZ5	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 350 GR.LF2 CL.1	BW	YLST74ZZ5	311
Valves Group									
GAV	VLV.GATE	.5	20		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM -SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514MC	514MCZZZ5	621
GAV/3	VLV.GATE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS316	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510MC	510MCZZZ5	621,312
GAV/2	VLV.GATE	2	20		API 6D/ ISO 14313	BODY-ASTM A 216 GR.WCB,MANUFACTURERS STANDARD	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DC	514DCZZZ5	980,621, 670
GAV/1	VLV.GATE	2	20		API 600/ ISO 10434	BODY-ASTM A 352 GR.LC3,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DB	514DBZZZ5	979,621
GLV	VLV.GLOBE	.5	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524MC	524MCZZZ5	621
CHV	VLV.CHECK	.75	20		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,SEAT-PTFE O-RING	WAF, 300, B-16.5, WAF/125AARH, SHT NO.- 534MC	534MCZZZ5	621
CHV/1	VLV.CHECK	.5	1.5		ANSI-B-16.34	BODY-ASTM A 182 GR.F316L,SEAT-INTEGRAL	SCRF, 800, 3000, B-1.20.1, SHT NO.- 530MC	530MCZZZ5	621
BLV	VLV.BALL	.5	16		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,BALL+STEM-SS 316; SEATS-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544MC	544MCZZZ5	621
BLV/2	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316 SEATS: PTFE	SW, 800, 3000, B-16.11, SHT NO.- 540DB	540DBZZZ5	621
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,BALL+STEM-SS316; SEATS-PTFE	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 540MC	540MCZZZ5	621
Bolt Group									
BOS	BOLT.STUD	.5	20		B-18.2	BOLT:A320 GR.L7 (HDG), NUT:A194 GR.7 (HDG)		BS44231Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B47A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	20		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 300	GK1DY74Z5	667
Trap/Strainer Group									
PSR	STRNR.PERM	.5	10		MNF'STD	B:A351GR.CF8M;I NT:SS316	FLGD, Y-TYPE, 300,RF/125AARH, SMGR/MAX125AARH	SP3A155B5	657

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 1 of 6

PIPE CLASS : **B48A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-40	38	93	149	177
PRESS	48.86	48.86	46.4	17.57	10.54

SERVICE

CONVEYING SOLIDS (BASED ON LICENSOR PMS CLASS - 2E65)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

318 BEND RADIUS IN SOLIDS CONVEYING SERVICE MUST BE 9-TIMES NOMINAL SIZE. COMMERCIAL ELBOW SHALL NOT BE USED. FOR BENDS PIPE MATERIAL IS ALSO ACCEPTABLE.

354 DO NOT USE "IN LINE" FOR CONVEYING.

558 INSTALL PLUGGED VENT APPROXIMATELY EVERY FIFTY (50) FEET ON TOP OF HORIZONTAL RUNS.

622 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 2E65

667 PTFE FILLER; CONDREN STYLE 913 OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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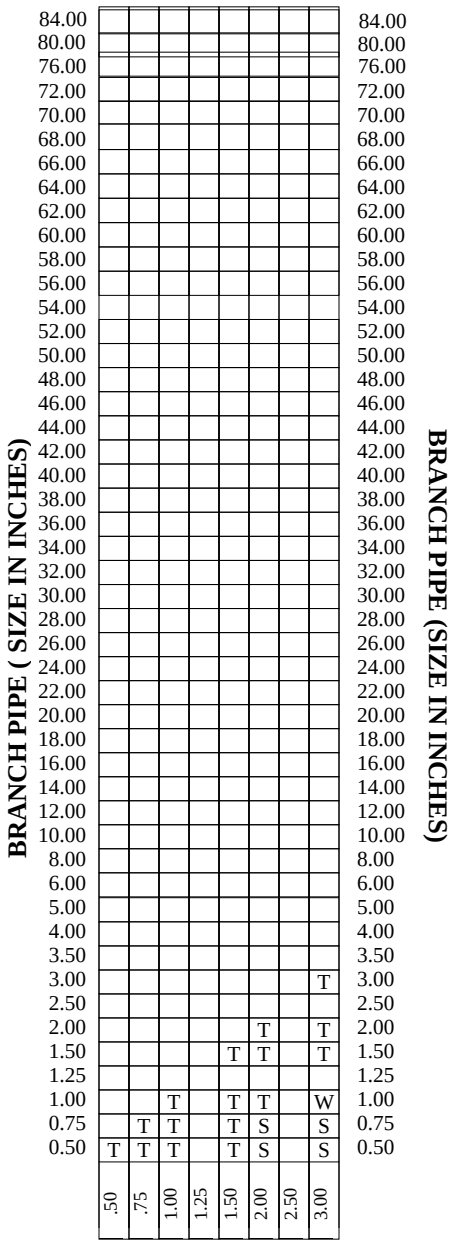
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SW COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B48A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z5	
PIP	PIPE	1	1	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z5	
PIP	PIPE	1.5	2	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
Flange Group									
FLG	FLNG.SW	.5	.75	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FSC4447Z5	
FLG	FLNG.WN	1	1	M	B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FWC4447Z5	
FLG	FLNG.WN	1.5	3	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	1		B-16.5	ASTM A 182 GR.F316	300, RF/125AARH	FBC4447Z5	
FLB	FLNG.BLIND	1.5	3		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	1		ASME-B16.48	ASTM A 182 GR.F316	300, RF/125AARH	FGK4447Z5	
FEF	FLNG.FIG.8	1.5	3		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z5	
ELB90	ELBOW.90	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z15	318
ELB90	ELBOW.90	1.5	3	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	318
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z5	
ELB45	ELBOW.45	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z15	318
ELB45	ELBOW.45	1.5	3	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	318
BND	PIPE.BEND	.5	.75	M	ASME B31.3	ASTM A 403 GR.WP304-S	PE, 9D	WCI8778Z5	318
BND	PIPE.BEND	1	1	M	ASME B31.3	ASTM A 403 GR.WP304-S	BW, 9D	WCI8748Z5	318
BND	PIPE.BEND	1.5	3	M	ASME B31.3	ASTM A 420 GR.WPL6	BW, 9D	WCIB448Z5	318
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z5	
TEQ	T.EQUAL	1	1	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ5	

Package : IPMCS
Report No. : 50

B48A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	1.5	3	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z5	
TRED	T.RED	1	1	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ5	
TRED	T.RED	1.5	3	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	1.5	3	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	1.5	3	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ5	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ5	
CAP	CAP	1.5	3	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
PLG	PLUG	.5	.75		B-16.11	ASTM A 182 GR.F304	SCRM, 3000	WH64292Z5	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z5	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 182 GR.F304	SW, 3000	YSS42D2Z5	
WLT	WELDOLET	1	1	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YWS424ZZ5	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 350 GR.LF2 CL.1	BW	YEST74ZZ5	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 350 GR.LF2 CL.1	BW	YLST74ZZ5	311
Valves Group									
BLV	VLV.BALL	.5	3		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,BALL + SEAT - SS316 +RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544MD	544MDZZZ5	622
BLV/1	VLV.BALL	.5	.75		BS EN ISO 17292	BODY-ASTM A 182 GR.F316,BALL + SEAT - SS316+	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 540MD	540MDZZZ5	312,622

Package : IPMCS
Report No. : 50

B48A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B48A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						RPTFE			
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A320 GR.L7 (HDG), NUT:A194 GR.7 (HDG)		BS44231Z5	
Gasket Group									
GAS	GASKET	.5	24		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 300	GK1DY74Z5	667

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4A** Sheet 1 of 5

PIPE CLASS : **B4A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	48.86	48.86	46.4	45.72	44.99	43.23

SERVICE

NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETC.

NOTES

1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

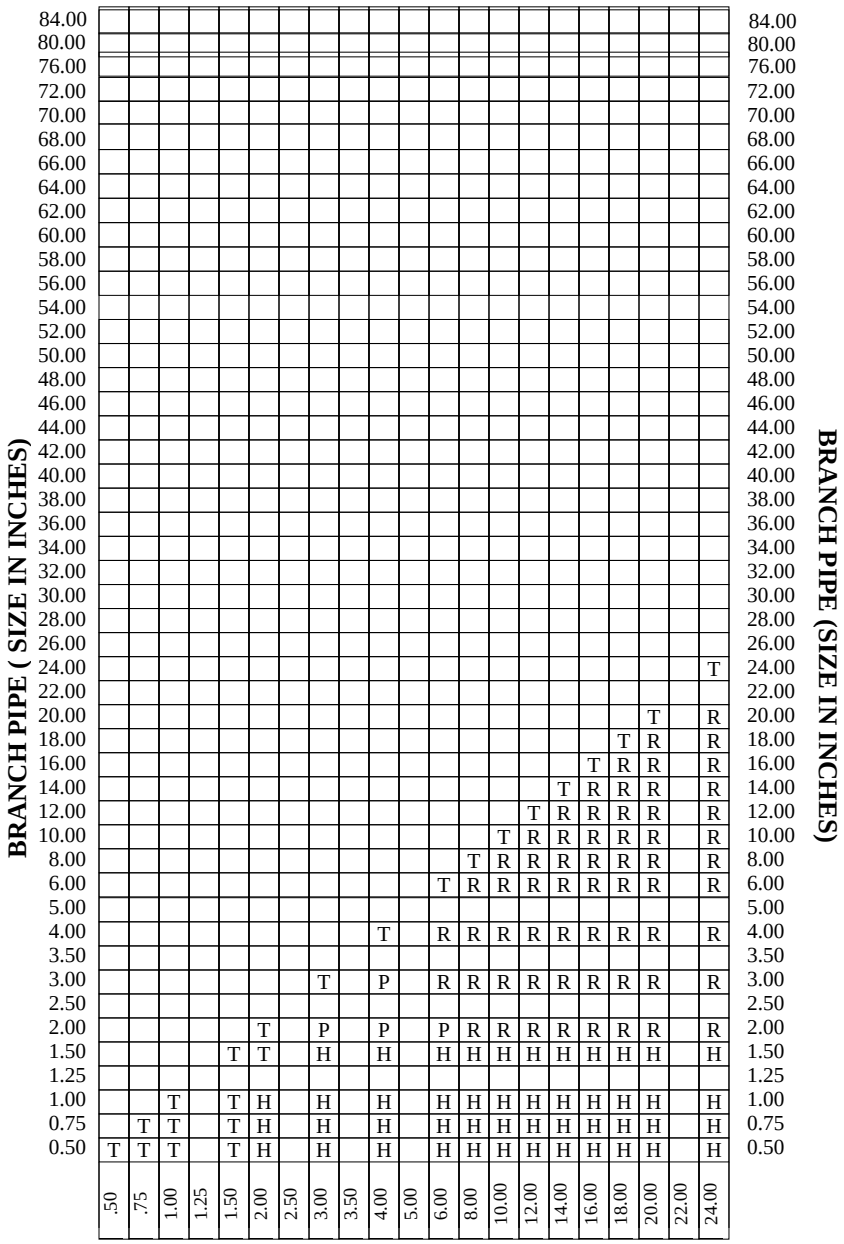
966 FOR LICENSOR SPECIFICATION LGP58 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-366 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B4A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	32
PIP	PIPE	18	20	XS	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
PIP	PIPE	24	24	14.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FSCD747Z5	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FWCD747Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	300, RF/125AARH	FBCD747Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FGKD741Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	300, FF/125AARH	FCKD741Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	24	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51403	51403ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52403	52403ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53403	53403ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL. 1,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54403	54403ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 300,FF/125AARH	ST17539Z5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS304	BW, T-TYPE	SP16644Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 1 of 6

PIPE CLASS : **B4D**
RATING : 300
BASE MATERIAL : 1.25 Cr + 0.5Mo
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49
	538													
	15.11													

SERVICE

NON CORROSIVE HYDROCARBONS ABOVE 454 DEG C
- FLAMMABLE & NON LETHAL- HIGH TEMPERATURE TRANSFER LINES.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

13 USE NORMALIZED AND TEMPERED MATERIAL ONLY.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

124 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [540 DEG. C & 4.2 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

153 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [540 DEG. C & 4.2 KG/ CM2 G] SUBJECT TO MINIMUM 20 MM.

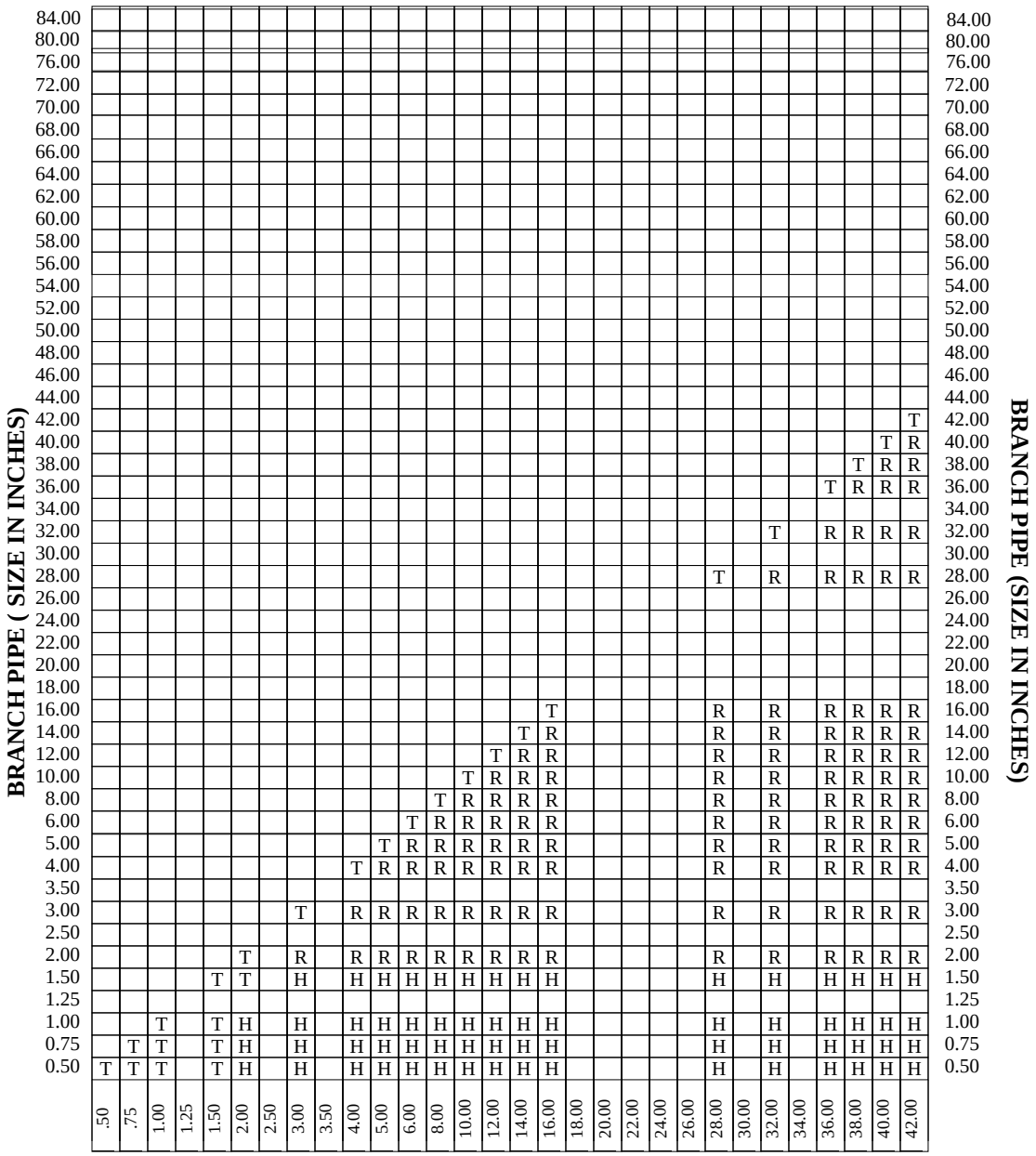
158 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [540 DEG. C & 4.2 KG/ CM2 G].

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 2 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B4D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	
PIP	PIPE	4	6	STD	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	32
PIP	PIPE	8	14	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z0	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	32
PIP	PIPE	28	28	18.0	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	124
PIP	PIPE	32	32	19.0	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	124
PIP	PIPE	36	42	20.0	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	153
PIP	PIPE	96	96	20.0	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	32,153
PIP	PIPE	124	124	25.0	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z0	158
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FSC3747Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FWC3747Z0	
FLG	FLNG.WN	26	42	M	B-16.47-B	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FWB3747Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FBC3747Z0	
FLB	FLNG.BLIND	26	42		B-16.47-B	ASTM A 182 GR.F11 CL.2	300, RF/125AARH	FBB3747Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F11 CL.2	300, FF/125AARH	FGK3741Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F11 CL.2	300, FF/125AARH	FCK3741Z0	
FEF	SPCR&BLND	26	42		EIL'STD	ASTM A 387 GR.11 CL.2	300, RF/125AARH	FCEC647Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WA638D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WA638D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WAG564Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WAG584Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WB638D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WB638D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WBG564Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WBG584Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WE638D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WE638D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WEG564ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WEG584ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WR638D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WR638D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WRG564ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WRG584ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WUG564ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WUG584ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WVG564ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WVG584ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WNH386ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WPH386ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WFG564ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WJ638D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WJ638D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WK638D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WK638D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WL638D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WL638D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WM638D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WM638D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51030	51030ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51430	51430ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52030	52030ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52430	52430ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53030	53030ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53430	53430ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B4D** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	42		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
GAS	GASKET	26	42		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A387GR.11CL.1;I NT:SS304	CONETYPE, 300,FF/125AARH	ST17439Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F11CL.2; INT:SS304	SW, Y-TYPE, 800	SP310D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WP11 CL.1; INT:SS304	BW, T-TYPE	SP17244Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WP11W CL.1;INT:SS304	BW, T-TYPE	SP17344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B52A** Sheet 1 of 6

PIPE CLASS : **B52A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	230
PRESS	52.02	52.02	47.8	46.05	44.64	43.66

SERVICE

HYDROGEN (FEED & PRODUCT)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

201 100% RADIOGRAPHY TO BE DONE FOR ALL BUTT WELDS.

202 ALL REQUIREMENTS OF ASME B31.12 SHALL BE MET.

203 BODY/BONNET/COVER JOINTS & STUFFING BOX OF ALL VALVES SHALL HAVE LOW EMISSION. ONE VALVE PER METALLURGY, PER RATING, PER SIZE SHALL BE HELIUM LEAK TESTED AS PER ASME SEC.V, SUBSECTION A,ARTICLE 10(DETECTOR PROBE TECHNIQUE), APPENDIX IV AT A MIN OF 25% OF THE ALLOWABLE (RATED) COLD WORKING PRESSURE.

597 FOR LINES WITH DESIGN TEMPERATURE EXCEEDING 230 DEG. C., PARTIAL PRESSURE OF H2 SHALL NOT EXCEED API RP 941 LIMITS.

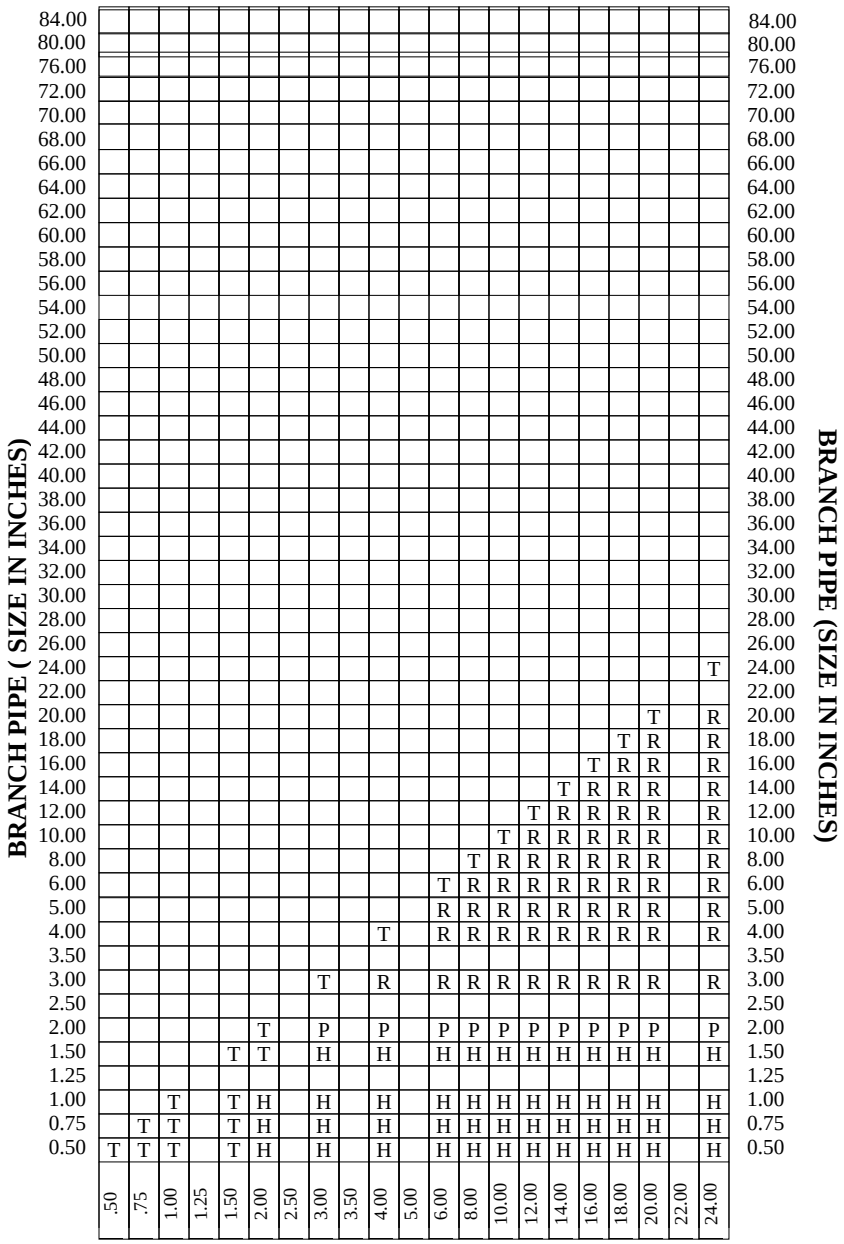
598 ALL WELDS IN LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C SHALL BE STRESS RELIEVED.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B52A

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Location BINA, MADHYA PRADESH	**Pipe Class :B52A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	12	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	
PIP	PIPE	18	18	XS	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	32
PIP	PIPE	20	20	14.0	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	32
PIP	PIPE	24	24	16.0	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	32
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z7	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z7	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z7	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z7	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z7	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z17	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z17	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ7	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ7	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ7	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ7	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ7	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ7	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z7	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z7	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z7	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z7	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51004	51004ZZZ7	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-HARDFACED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51404	51404ZZZ7	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52004	52004ZZZ7	
GLV	VLV.GLOBE	2	16		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-HARDFACED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52404	52404ZZZ7	
CHV	VLV.CHECK	.5	1.5		BS EN ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53004	53004ZZZ7	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-HARDFACED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53404	53404ZZZ7	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54404	54404ZZZ7	
BFV	VLV.BTRFLY	3	24		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-HARDFACED	WAFL, 300, B-16.5, WAF/125AARH, SHT NO.- 564CD	564CDZZZ7	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z7	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z7	

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Location BINA, MADHYA PRADESH	**Pipe Class :B52A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D517	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z7	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z7	

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Location BINA, MADHYA PRADESH	**Pipe Class :B55A** Sheet 1 of 6

PIPE CLASS : **B55A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93
PRESS	52	52	47.8

SERVICE

HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP57)

NOTES

15 FOR LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C, POST WELD HEAT TREATMENT IS REQUIRED FOR ALL WELD JOINTS IRRESPECTIVE OF THICKNESS.

16 DESIGN TEMPERATURE FOR THIS CLASS CAN BE HIGHER THAN 230 DEG. C, PROVIDED THE MATERIAL IS SUITABLE FOR HYDROGEN PARTIAL PRESSURE AND MAXIMUM OPERATING TEMPERATURE OF THE SERVICE AS PER NELSON CURVE API RP 941.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

600 USE ONLY FOR INSTRUMENTATION CONNECTION.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

832 SHUT-OFF SERVICE; 6000 PSI; SPECIAL UNION ENDS; OUTSIDE SCREW; RISING STEM; RISING HANDWHEEL; BONNET: THREADED; STEM: 316 STAINLESS STEEL GUIDE ASSEMBLY: COPPER NICKEL WITH VESPEL DISC; SEAT: MONEL; PACKING: BUNA-N; BODY O-RING: BUNA-N WITH PTFE BACK UP RING; SEAT O-RING: BUNA-N

833 PREPARED FOR GAS PHASE PP SERVICE

834 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 380-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS.

835 VALVE; CHECK; UNIBODY; SPRING LOADED AXIALLY OPENING DISC; 6000 PSI; SPECIAL UNION ENDS; BODY: ASTM B150 ALUMINUM BRONZE; SEAT / DISC: 304 STAINLESS STEEL; SEAT O-RING: BUNA-N; DISC O-RING: BUNA-N

836 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 123-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS.

840 USE FOR VENTS AND DRAINS WITH CPV- 'O-SEAL' BLANK FITTING FIGURE NUMBER 104R WITH O-RING.

841 VALVE; GLOBE; NEEDLE SERVICE; 6000 PSI; SPECIAL UNION ENDS; OUTSIDE SCREW; RISING STEM; RISING HANDWHEEL; BONNET: THREADED; STEM: 316 STAINLESS STEEL GUIDE ASSEMBLY: COPPER NICKEL WITH VESPEL DISC; SEAT: MONEL; PACKING: BUNA-N; BODY O-RING: BUNA-N WITH PTFE BACK UP RING; SEAT O-RING: BUNA-N;

842 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 480-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS. (CONT.)

843 (CONT. FROM NOTE NO. 842) VALVE IS TO BE PURCHASED WITH UNION NUT, APPROPRIATE TAIL PIECE FOR TUBING CONNECTION AND O-RING. CONSULT MANUFACTURERS CATALOG FOR APPROPRIATE TAILPIECE FIGURE NUMBER.

939 LICENSOR PMS LGP57 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

957 WITH FLEXITE SUPER (MICA / GRAPHITE) GASKET AND STAINLESS STEEL RETAINER.

959 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.

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FOR SIZE RANGE 1/2" TO 1" : STR-366 IS TO BE FOLLOWED

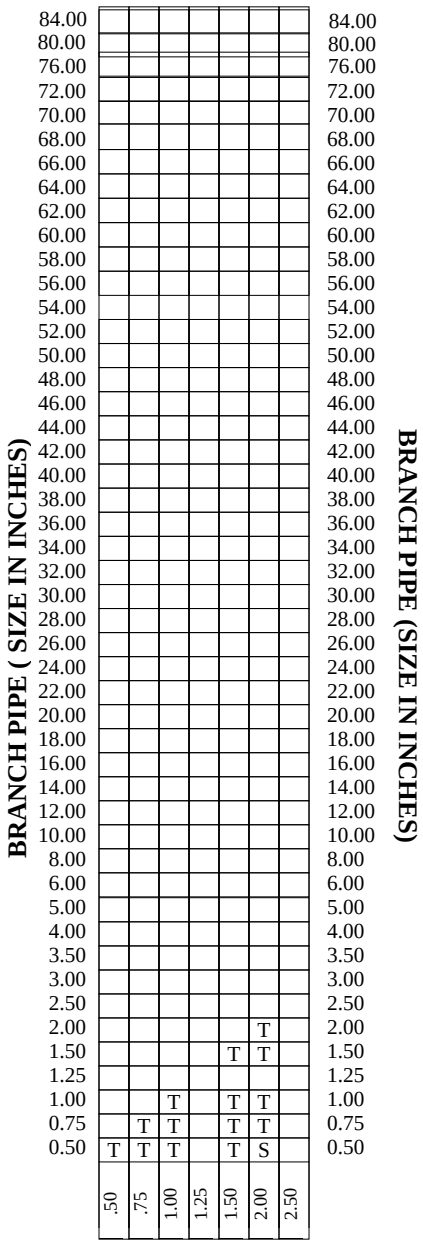
988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-939	
	ON LINES >= 2.0"	NOTE-939	
VENTS	ON LINES <= 1.5"	NOTE-939	
	ON LINES >= 2.0"	NOTE-939	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-939)	
PRESS.CONN	0.75"	NOTE-939	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B55A

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Location BINA, MADHYA PRADESH	**Pipe Class :B55A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
NIP/	NIPPLE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
NIP	NIPPLE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z7	
FLG	FLNG.WN	.5	.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z7	
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z7	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z7	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z7	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z7	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z7	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z7	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z7	
UNN	UNION	.5	.75		MSS-SP83	ASTM A 105	SW, 6000	WQR02D3Z7	957
UNN	UNION	1	1.5		MSS-SP83	ASTM A 105	SW, 3000	WQR02D2Z7	957
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z7	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z7	
Valves Group									
GLV	VLV.GLOBE	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),STEM-SS 316,SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-524PR	524PRZZZ7	832,833, 834,840, 742
GLV/1	VLV.GLOBE	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),STEM-SS 316,SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-524QR	524QRZZZ7	841,833, 842,843, 600
CHV	VLV.CHECK	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B150),TRIM-SS 304	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-534PR	534PRZZZ7	835,833, 836,742
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H		BS44938Z7	988

Package : IPMCS
Report No. : 50

B55A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B55A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
						(PTFE COATED)			
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z7	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B5A** Sheet 1 of 5

PIPE CLASS : **B5A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	230
PRESS	52.02	52.02	47.8	46.05	44.64	43.66

SERVICE

HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE, TOXIC/NON-TOXIC BUT NON-LETHAL.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

15 FOR LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C, POST WELD HEAT TREATMENT IS REQUIRED FOR ALL WELD JOINTS IRRESPECTIVE OF THICKNESS.

16 DESIGN TEMPERATURE FOR THIS CLASS CAN BE HIGHER THAN 230 DEG. C, PROVIDED THE CARBON STEEL MATERIAL IS SUITABLE FOR HYDROGEN PARTIAL PRESSURE AND MAXIMUM OPERATING TEMPERATURE AS PER NELSON CURVE API RP 941.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

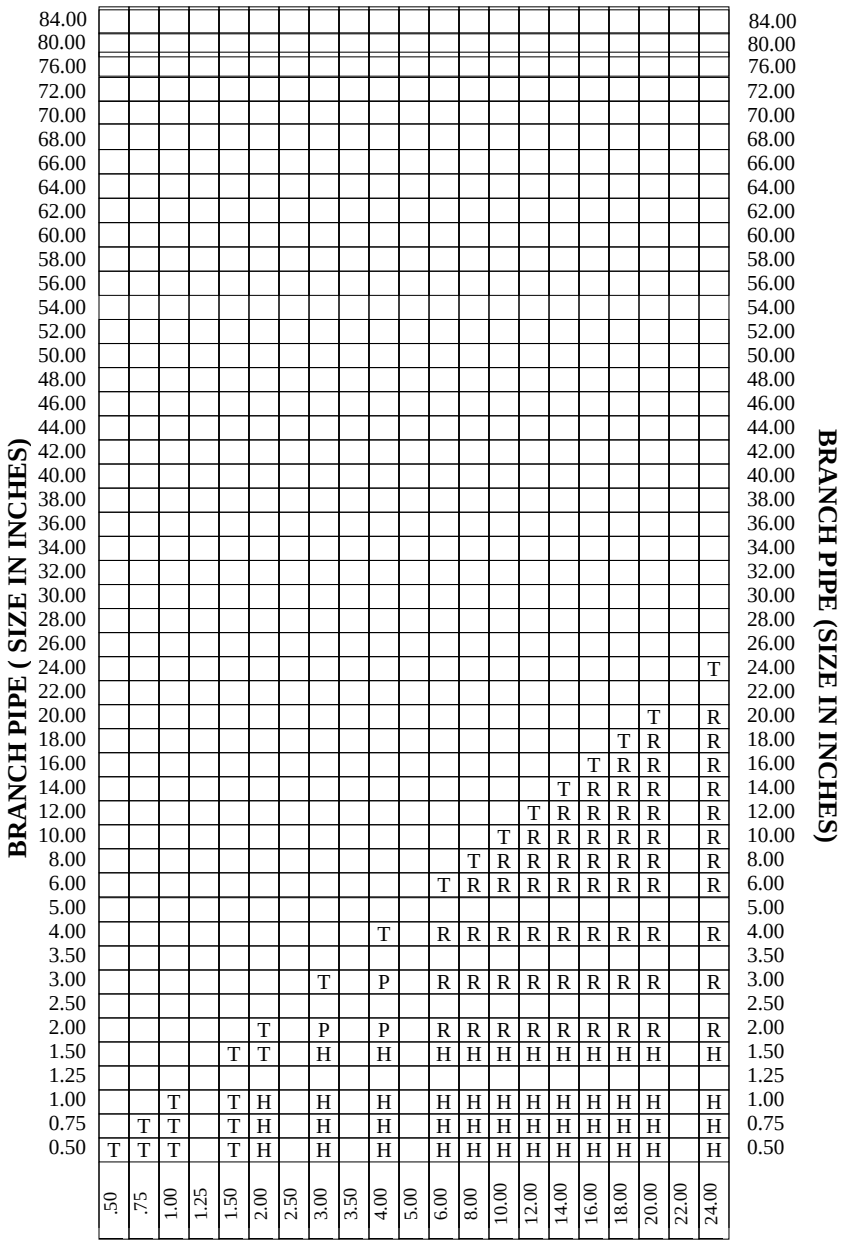
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B5A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B5A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B5A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	16	20	XS	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	
PIP	PIPE	24	24	S30	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	32
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z7	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z7	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z7	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z7	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z7	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z17	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z17	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B5A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ7	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ7	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ7	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ7	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ7	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ7	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z7	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z7	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z7	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z7	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 51004	51004ZZZ7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B5A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-13%CR STEEL			
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51404	51404ZZZ7	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52004	52004ZZZ7	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52404	52404ZZZ7	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53004	53004ZZZ7	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53404	53404ZZZ7	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54404	54404ZZZ7	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z7	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z7	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D517	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z7	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B60K** Sheet 1 of 5

PIPE CLASS : **B60K**
RATING : 300
BASE MATERIAL : SS 304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	42.18	42.18	35.85	31.99	29.52

SERVICE

RICH AMINE, RICH AMINE WITH FLASHING H2S.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

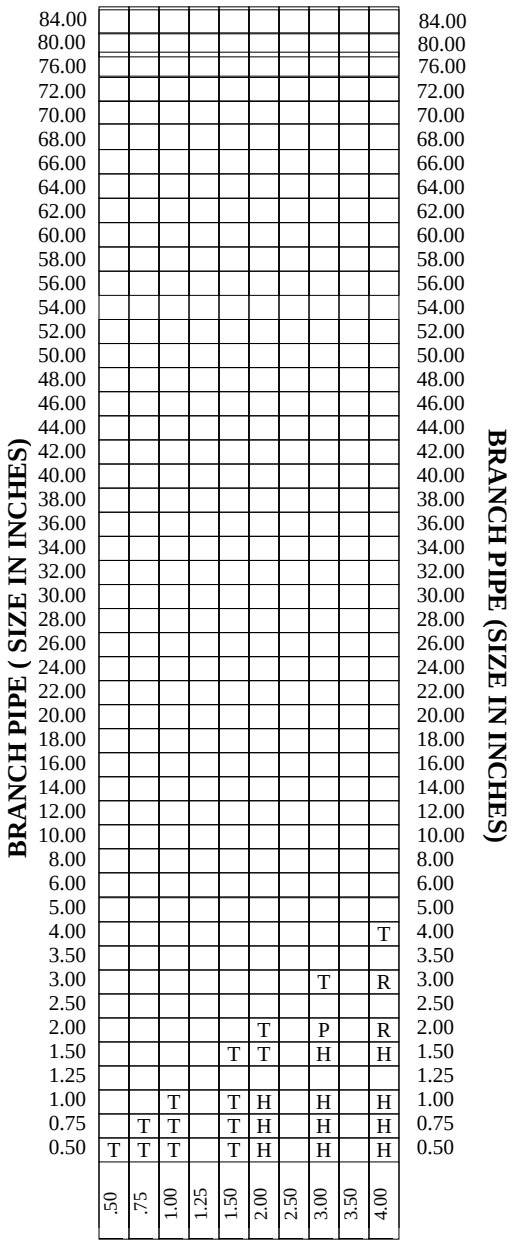
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 075". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B60K** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B60K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B60K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304L	PE, SEAMLESS	PI33777Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z0	
PIP	PIPE	3	4	10S	B-36.19	ASTM A 312 TP304L	BE, SEAMLESS	PI33717Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304L	PBE, SEAMLESS	PN33767Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FSC4347Z0	
FLG	FLNG.WN	2	4	M	B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FWC4347Z0	
FLB	FLNG.BLIND	.5	4		B-16.5	ASTM A 182 GR.F304L	300, RF/125AARH	FBC4347Z0	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F304L	300, FF/125AARH	FGK4341Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WA644D2Z0	
ELB90	ELBOW.90	2	4	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WAG934Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WB644D2Z0	
ELB45	ELBOW.45	2	4	M	B-16.9	ASTM A 403 GR.WP304L-S	BW, 1.5D	WBG934Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WE644D2Z0	
TEQ	T.EQUAL	2	4	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WEG934ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WR644D2Z0	
TRED	T.RED	2	4	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WRG934ZZ0	
REDC	REDUC.CONC	2	4	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WUG934ZZ0	
REDE	REDUC.ECC	2	4	M, M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WVG934ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WNH446ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304L	PBE	WPH446ZZ0	

Package : IPMCS
Report No. : 50

B60K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B60K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	2	4	M	B-16.9	ASTM A 403 GR.WP304L-S	BW	WFG934ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WJ644D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WK644D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WL644D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304L	SW, 3000	WM644D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 510AM	510AMZZZ0	
GAV	VLV.GATE	2	4		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514AM	514AMZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 520AM	520AMZZZ0	
GLV	VLV.GLOBE	2	4		BS-1873	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524AM	524AMZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530AM	530AMZZZ0	
CHV	VLV.CHECK	2	4		BS-1868	BODY-ASTM A 351 GR.CF3M,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534AM	534AMZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	4		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	4		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	4		EIL'STD	B:A240TP304L;INT:SS316L	CONETYPE, 300,FF/125AARH, RTJ/63AARH	ST1N839Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304L;INT:SS316L	SW, Y-TYPE, 800	SP3B6D510	

Package : IPMCS
Report No. : 50

B60K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B60K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	2	4	M	EIL'STD	B:A403WP304L-S;INT:SS316L	BW, T-TYPE	SP1B744Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B61A** Sheet 1 of 5

PIPE CLASS : **B61A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : NACE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	52.02	52.02	47.8	46.05	44.64	42.53

SERVICE

NACE CORROSIVE, FLAMMABLE AND NONLETHAL SOUR SERVICES (STRESS RELIEVED)
- SOUR WATER, AMINE, SOUR HYDRO CARBONS(H2S), METHANOL

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.

35 ALL TYPES OF WELDS INCLUDING GIRTH WELDS SHALL BE WET FLOURESCENT MP TESTED.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

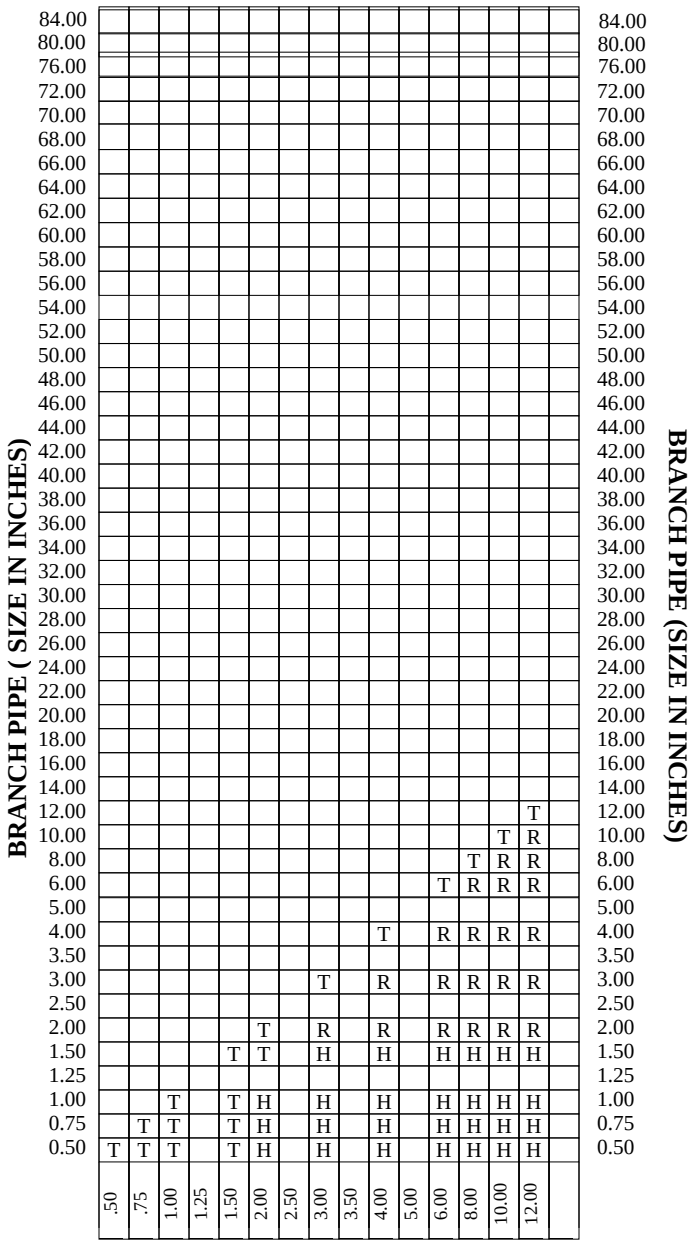
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-440351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B61A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B61A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B61A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	12	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
NIP	NIPPLE	.5	.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
NIP	NIPPLE	.75	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	32
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z2	
FLG	FLNG.WN	2	12	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z2	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z2	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z2	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z2	
Fitting Group									
ELB90	ELBOW.90	.5	.5		B-16.11	ASTM A 105	SW, 9000	WA602D4Z2	
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WA602D3Z2	
ELB90	ELBOW.90	2	12	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z12	
ELB45	ELBOW.45	.5	.5		B-16.11	ASTM A 105	SW, 9000	WB602D4Z2	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WB602D3Z2	
ELB45	ELBOW.45	2	12	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z12	
TEQ	T.EQUAL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WE602D4Z2	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WE602D3Z2	
TEQ	T.EQUAL	2	12	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B61A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WR602D4Z2	
TRED	T.RED	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WR602D3Z2	
TRED	T.RED	2	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ2	
REDC	REDUC.CONC	2	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ2	
REDE	REDUC.ECC	2	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ2	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ2	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ2	
CAP	CAP	2	12	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ2	
CPLF	CPLNG.FULL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WJ602D4Z2	
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z2	
CPLH	CPLNG.HALF	.5	.5		B-16.11	ASTM A 105	SW, 9000	WK602D4Z2	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WK602D3Z2	
CPLL	CPLNG.LH	.5	.5		B-16.11	ASTM A 105	SW, 9000	WL602D4Z2	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WL602D3Z2	
CPLR	CPLNG.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WM602D4Z2	
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WM602D3Z2	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 51011	51011ZZZ2	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51411	51411ZZZ2	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 52011	52011ZZZ2	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52411	52411ZZZ2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B61A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53011	53011ZZZ2	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53411	53411ZZZ2	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 55411	55411ZZZ2	
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B7M, NUT:A194 GR.2HM		BS43405Z2	
Gasket Group									
GAS	GASKET	.5	12		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z2	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	12		EIL'STD	B:A516GR.70;INT:SS316L	CONETYPE, 300,FF/125AARH, RTJ/63AARH	ST16939Z2	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316L	SW, Y-TYPE, 800	SP305D512	
PSR	STRNR.PERM	2	12	M	EIL'STD	B:A234GR.WPB;INT:SS316L	BW, T-TYPE	SP14044Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B62A** Sheet 1 of 5

PIPE CLASS : **B62A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 6 MM
SPECIAL REQUIREMENT : NACE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	52.02	52.02	47.8	46.05	44.64	42.53

SERVICE

AMINE, RICH AMINE WITH FLASHING H2S

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.

35 ALL TYPES OF WELDS INCLUDING GIRTH WELDS SHALL BE WET FLOURESCENT MP TESTED.

42 ALL WELDS SHALL BE STRESS RELIEVED.

93 NACE REQUIREMENT OF MR0103 SHALL BE MET.

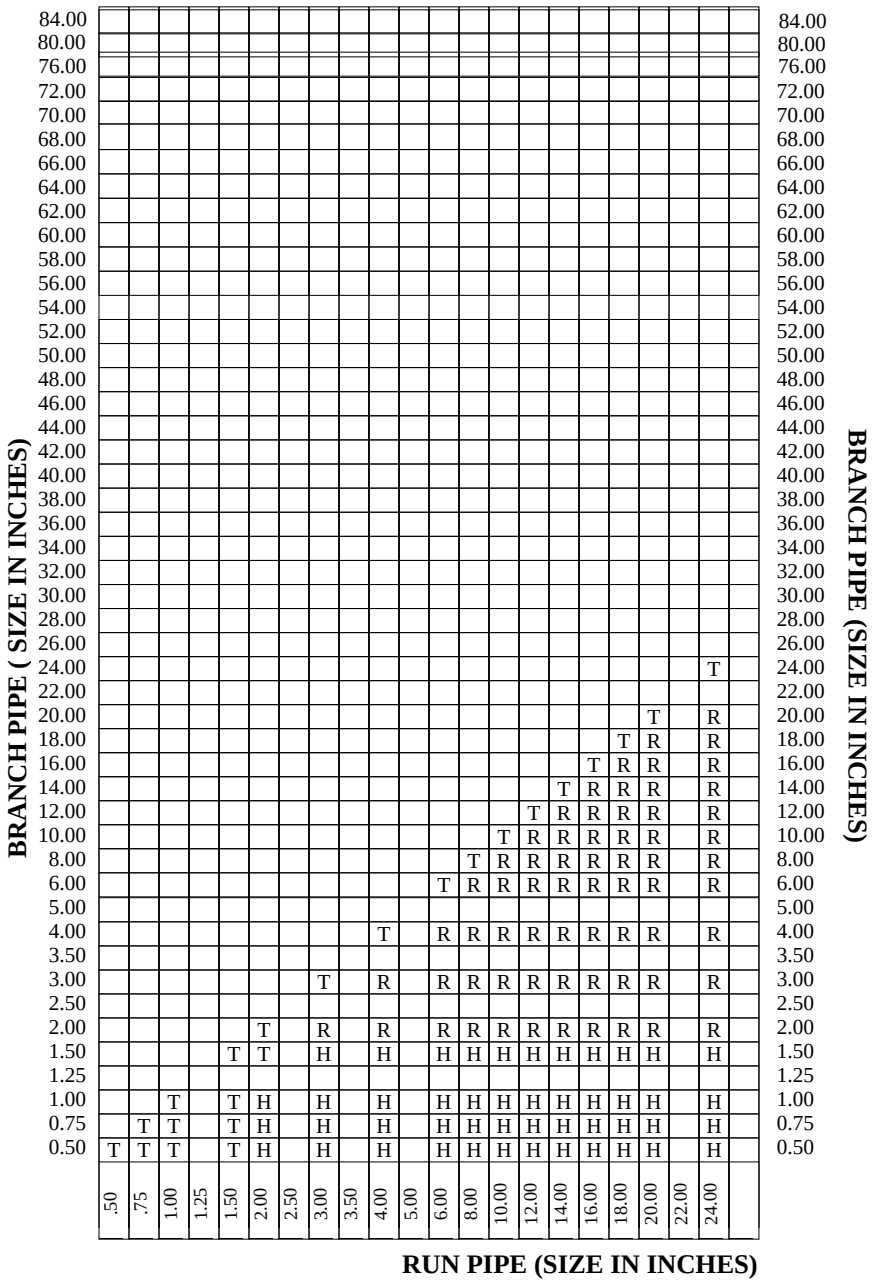
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-440351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B62A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B62A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B62A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	XXS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z2	
PIP	PIPE	2	2	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	3	3	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	4	4	S120	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	6	10	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	12	14	S60	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z2	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z2	
NIP	NIPPLE	.5	.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
NIP	NIPPLE	.75	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	32
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z2	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z2	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z2	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z2	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z2	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z2	
Fitting Group									
ELB90	ELBOW.90	.5	.5		B-16.11	ASTM A 105	SW, 9000	WA602D4Z2	
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WA602D3Z2	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z12	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z12	
ELB45	ELBOW.45	.5	.5		B-16.11	ASTM A 105	SW, 9000	WB602D4Z2	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WB602D3Z2	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z12	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B62A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z12	
TEQ	T.EQUAL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WE602D4Z2	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WE602D3Z2	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ2	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ2	
TRED	T.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WR602D4Z2	
TRED	T.RED	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WR602D3Z2	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ2	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ2	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ2	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ2	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ2	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ2	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ2	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ2	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ2	
CPLF	CPLNG.FULL	.5	.5		B-16.11	ASTM A 105	SW, 9000	WJ602D4Z2	
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z2	
CPLH	CPLNG.HALF	.5	.5		B-16.11	ASTM A 105	SW, 9000	WK602D4Z2	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WK602D3Z2	
CPLL	CPLNG.LH	.5	.5		B-16.11	ASTM A 105	SW, 9000	WL602D4Z2	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WL602D3Z2	
CPLR	CPLNG.RED	.5	.5		B-16.11	ASTM A 105	SW, 9000	WM602D4Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B62A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A 105	SW, 6000	WM602D3Z2	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 51011	51011ZZZ2	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51411	51411ZZZ2	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-SS 316L	SW, 800, 3000, B-16.11, SHT NO.- 52011	52011ZZZ2	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52411	52411ZZZ2	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53011	53011ZZZ2	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53411	53411ZZZ2	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 55411	55411ZZZ2	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7M, NUT:A194 GR.2HM		BS43405Z2	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z2	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS316L	CONETYPE, 300,FF/125AARH	ST16939Z2	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS316L	SW, Y-TYPE, 800	SP305D512	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS316L	BW, T-TYPE	SP14044Z2	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS316L	BW, T-TYPE	SP13844Z2	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B69M** Sheet 1 of 4

PIPE CLASS : **B69M**
RATING : 300
BASE MATERIAL : SS 316/316L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	50.5	50.5	43.59	39.37	36.2	33.74

SERVICE

SPENT CAUSTIC

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

51 DESIGN PRESSURE AT -29 DEG.C. AND 38 DEG.C. FOR THIS PRESSURE HAS BEEN REDUCED FROM 50.62 KG/CM2G TO 50.50 KG/CM2G TO OPTIMISE THE THICKNESS FOR 6" SIZE.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

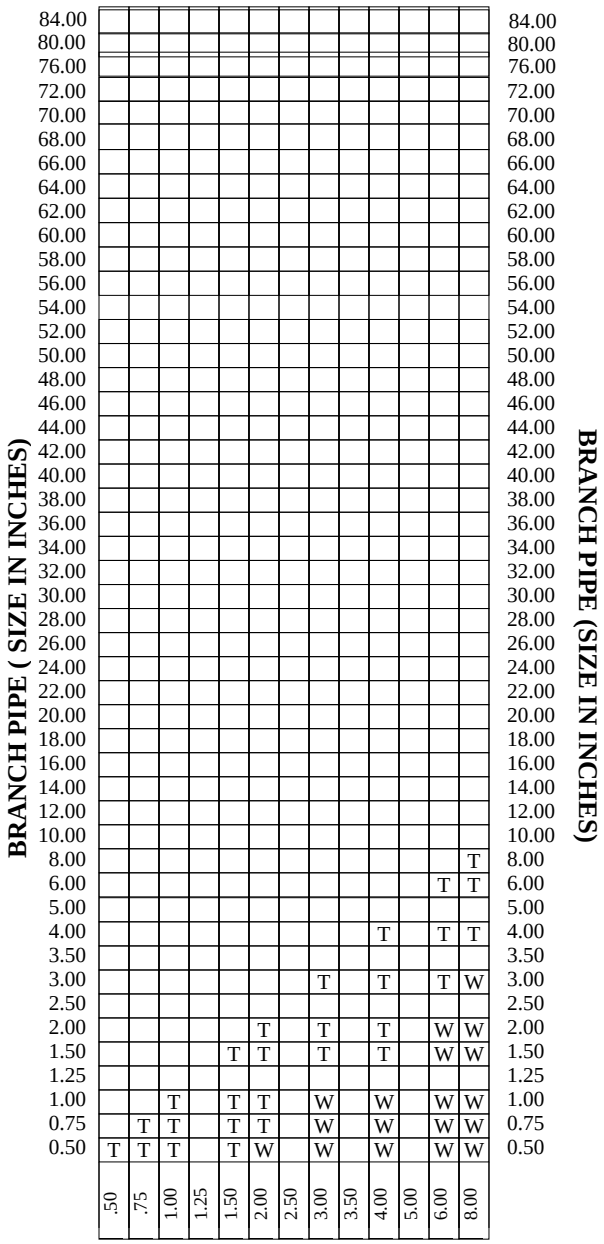
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B69M** Sheet 2 of 4



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B69M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B69M** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	3	4	10S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	6	6	10S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	51
PIP	PIPE	8	8	6.35	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
NIP/	NIPPLE	.5	.75	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
NIP/	NIPPLE	1	1.5	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
Flange Group									
FLG	FLNG.WN	.5	8	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	300, RF/125AARH	FWCF747Z0	
FLB	FLNG.BLIND	.5	8		B-16.5	ASTM A 182 GR.F316/316L DUAL	300, RF/125AARH	FBCF747Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	300, FF/125AARH	FGKF741Z0	
Fitting Group									
ELB90	ELBOW.90	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WAGX24Z10	
ELB45	ELBOW.45	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WBGX24Z10	
TEQ	T.EQUAL	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WEGX24ZZ0	
TRED	T.RED	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WRGX24ZZ0	
REDC	REDUC.CONC	.5	8	M, M	B-16.9	ASTM A403	BW	WUGX24ZZ0	

Package : IPMCS
Report No. : 50

B69M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B69M** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
						GR.WP316/316L-S DUAL			
REDE	REDUC.ECC	.5	8	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WVGX24ZZ0	
CAP	CAP	.5	8	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WFGX24ZZ0	
O'let Group									
WLT	WELDOLET	.5	8	M, M	MSS-SP97	ASTM A182 GR.F316/316L DUAL	BW	YWSX14ZZ0	
Valves Group									
GAV	VLV.GATE	.5	8		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DN	514DNZZZ0	
GLV	VLV.GLOBE	.5	8		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DN	524DNZZZ0	
CHV	VLV.CHECK	.5	8		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DN	534DNZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	8		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	8		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 1 of 6

PIPE CLASS : **B81A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	66	93	110	149
PRESS	52.02	52.02	49.7	47.45	47.03	46.05

SERVICE

ALKYLS,ADDITIVES & CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1E20)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

341 PIPING SHALL PASS A SENSITIVE LEAK TEST IN ACCORDANCE WITH PPM-570 PRIOR TO INITIAL OPERATION.

345 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE THREAD DOPE WHERE SEAL WELDING AND COVER ALL EXPOSED THREADS WITH WELD.

346 SAFEGUARD AND SUPPORT NPS 0.5" PIPING IN STRUCTURAL CHANNEL MATERIAL.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

614 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E20

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

639 REFER LICENSOR SPECIFICATION FOR STR-354 FOR STRAINERS.

665 GRAFOIL FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

977 TO BE USED IN DC, TT AND OTHER CHLORINATED HYDROCARBON SERVICE

978 NOT TO BE USED FOR DC, TT OR OTHER CHLORINATED HYDROCARBON SERVICE

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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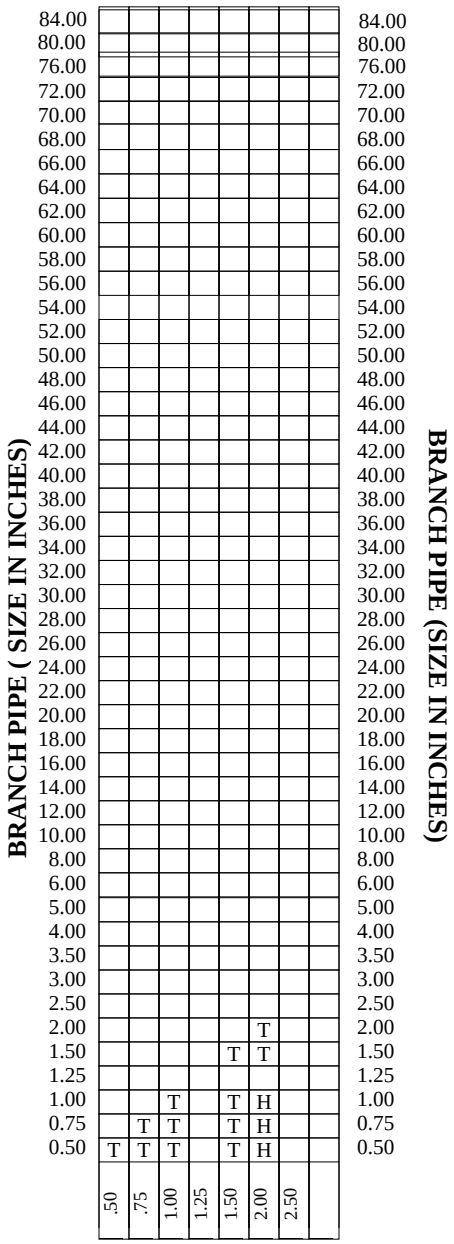
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SW COUPLING	
	1.5" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B81A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1.5	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	1.5	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	1.5	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1.5	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1.5	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	1.5	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	1.5	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	1		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	422
CAP	CAP	1.5	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
CHV	VLV.CHECK	.5	.75		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,SEAT-SS316	SW, 800, 3000, B-16.11, SHT NO.-530MA	530MAZZZ0	614
CHV	VLV.CHECK	1	2		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS316;SEAT- PTFE O RING	WAF, 150, B-16.5, WAF/125AARH, SHT NO.- 534MA	534MAZZZ0	614
BLV	VLV.BALL	.5	.75		MNF'STD	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.-540CD	540CDZZZ0	977,312, 614
BLV	VLV.BALL	.5	1		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS316; SEAT-RPTFE	SW, 800, 3000, B-16.11, SHT NO.-540MA	540MAZZZ0	614,978

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B81A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV	VLV.BALL	1.5	2		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS 316;SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544QA	544QAZZZ0	614
BLV/4	VLV.BALL	1.5	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM - MONEL SEAT: PTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544BA	544BAZZZ0	977,614
BLV/2	VLV.BALL	.5	1		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-K-MONEL; SEAT : RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540BA	540BAZZZ0	614,977
BLV/1	VLV.BALL	.5	1		MNF'STD	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS316; SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540QA	540QAZZZ0	312,614, 978
Bolt Group									
BOS	BOLT.STUD	.5	8		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	2		API-601	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK16274Z0	665
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1		MNF'STD	B:A216GR.WCB;INT:SS304	SW, Y-TYPE, 800	SP380D510	637
PSR	STRNR.PERM	1.5	2		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 300,RF/125AARH, SMGR/MAX125AARH	SP38055B0	639

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B82A** Sheet 1 of 5

PIPE CLASS : **B82A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	66	93	149	177
PRESS	45.69	45.69	42.18	33.74	16.87	7.03

SERVICE

COVEYING SOILDS (BASED ON LICENSOR PMS CLASS - 1E23)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

318 BEND RADIUS IN SOLIDS CONVEYING SERVICE MUST BE 9-TIMES NOMINAL SIZE. COMMERCIAL ELBOW SHALL NOT BE USED. FOR BENDS PIPE MATERIAL IS ALSO ACCEPTABLE.

319 PROVIDE WELDED GROUNDING CLIPS AT FLANGED EQUIPMENT AND ON BOTH SIDES OF FLANGED JOINTS.

320 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION. DO NOT USE IN-LINE FOR CONVEYING.

328 JOINTS INCLUDING EQUIPMENT CONNECTIONS, SHALL BE ELECTRICALLY BONDED AND PIPING GROUNDED.

354 DO NOT USE "IN LINE" FOR CONVEYING.

549 RUN AN ELECTRICAL CONTINUITY TEST EACH TIME THE PIPEWORK IS ASSEMBLED, AND AT LEAST ONCE A YEAR.

558 INSTALL PLUGGED VENT APPROXIMATELY EVERY FIFTY (50) FEET ON TOP OF HORIZONTAL RUNS.

616 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E23

664 PTFE FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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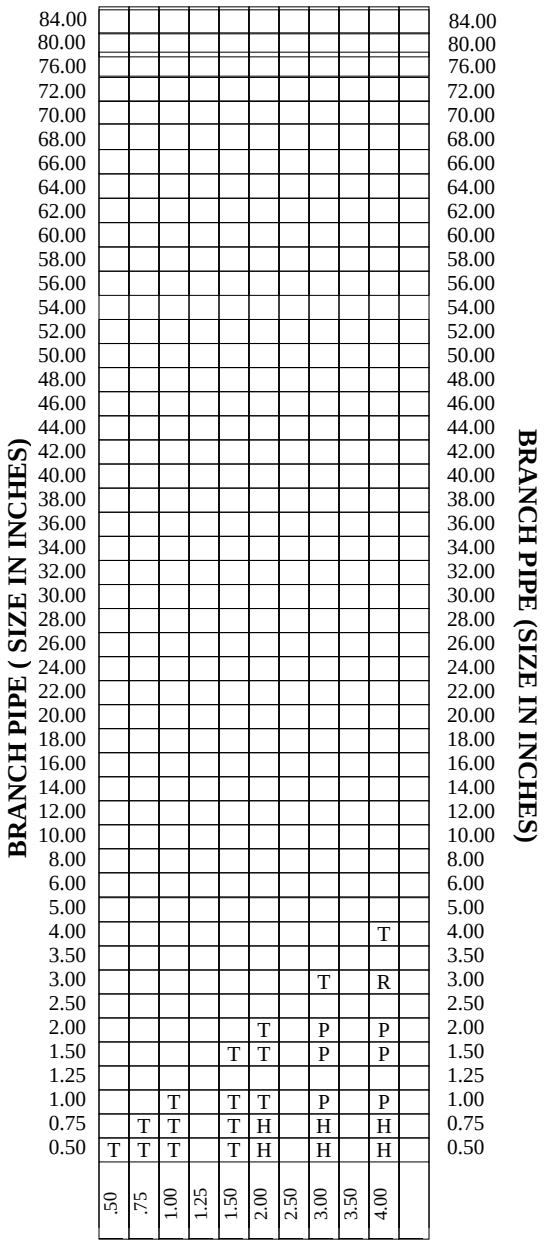
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B82A** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SW COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :B82A** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B82A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B82A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	STD	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	2	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	4	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.SW	.5	.75	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	1	4	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	4		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
Fitting Group									
BND	PIPE.BEND	.5	.75	M	ASME B31.3	ASTM A 234 GR.WPB	PE, 9D	WCI6878Z0	318
BND	PIPE.BEND	1	4	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 9D	WCI6848Z0	318
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1	4	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1	4	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	2	4	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	4	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	1	4	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	.75		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B82A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
BLV	VLV.BALL	.5	4		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,BALL +STEM-SS316,SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544LB	544LBZZZ0	616
BLV/1	VLV.BALL	.5	.75		MNF'STD	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS316,SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540LB	540LBZZZ0	320,616
Bolt Group									
BOS	BOLT.STUD	.5	4		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	4		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 300	GK1DY74Z0	664

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 1 of 7

PIPE CLASS : **B84A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	29.87	29.87	29.87	29.87	29.87

SERVICE

CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E22)

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 20.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

123 PIPING WITH THICKNESS>12.7 SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

340 USE FOR VENTAND DRAIN CONNECTION WHERE VALVE IS NORMALLY CLOSED(SW INLET AND SCRD OUTLET) .

347 USE FOR INSTRUMENT CONNECTION WHERE VALVE IS NORMALLY OPEN (SW INLET AND SCRD OUTLET) .

374 ONLY USE DEPEND ON P&ID NOTE.

386 316 SS 3-PLY CORRUGATED GASKET SIMILAR TO LAMONS STYLE 340, MELRATH 1900, FLEXITALLIC 129 OR EQUAL, 1/8" THK (NOMINAL). CORRUGATED-JACKETED METAL GASKET WITH CORRUGATED METAL FILLER (CORE). PITCH OF CORRUGATIONS- 3/16"; JACKET MATERIAL-0.019" THK; FILLER MATERIAL-1/32" THK (CONTD)

387 DESIGN SEATING STRESS (Y) = 6500 PSIG AND GASKET FACTOR (M) = 3.5. GASKET TO BE FITTED WITH CENTERING TABS. BOTH SIDES OF 3-PLY CORRUGATED GASKET TO BE FURNISHED (FROM THE MANUFACTURER) WITH ONE LAYER OF 0.015" THICK GRAFTECH, INC. GRAFOIL GRADE GTH (DO NOT SUBSTITUTE) ADHESIVE-BACKED TAPE. (CONTD.)

388 TAPE SHALL PROVIDE COMPLETE COVERAGE OF THE CONTACT AREA OF THE INSTALLED GASKET WITH A MIN NUMBER OF JOINTS HAVING AN OVERLAP NOT EXCEEDING 1/16". TAPE SHALL BE INSTALLED IN ACCORDANCE WITH RECOMMENDATIONS OF GRAFTECH, INC. TECH BULLETIN G-202.

588 FOR HDPE UNIT (LICENSOR : CP CHEM) THE MINIMUM CLASS TEMPERATURE SHALL BE READ AS -10 DEG C IN PLACE OF -29 DEG C.

615 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E22

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

639 REFER LICENSOR SPECIFICATION FOR STR-354 FOR STRAINERS.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

976 USE WHEN TEMPERATURE IS MORE THAN 176 DEG.C

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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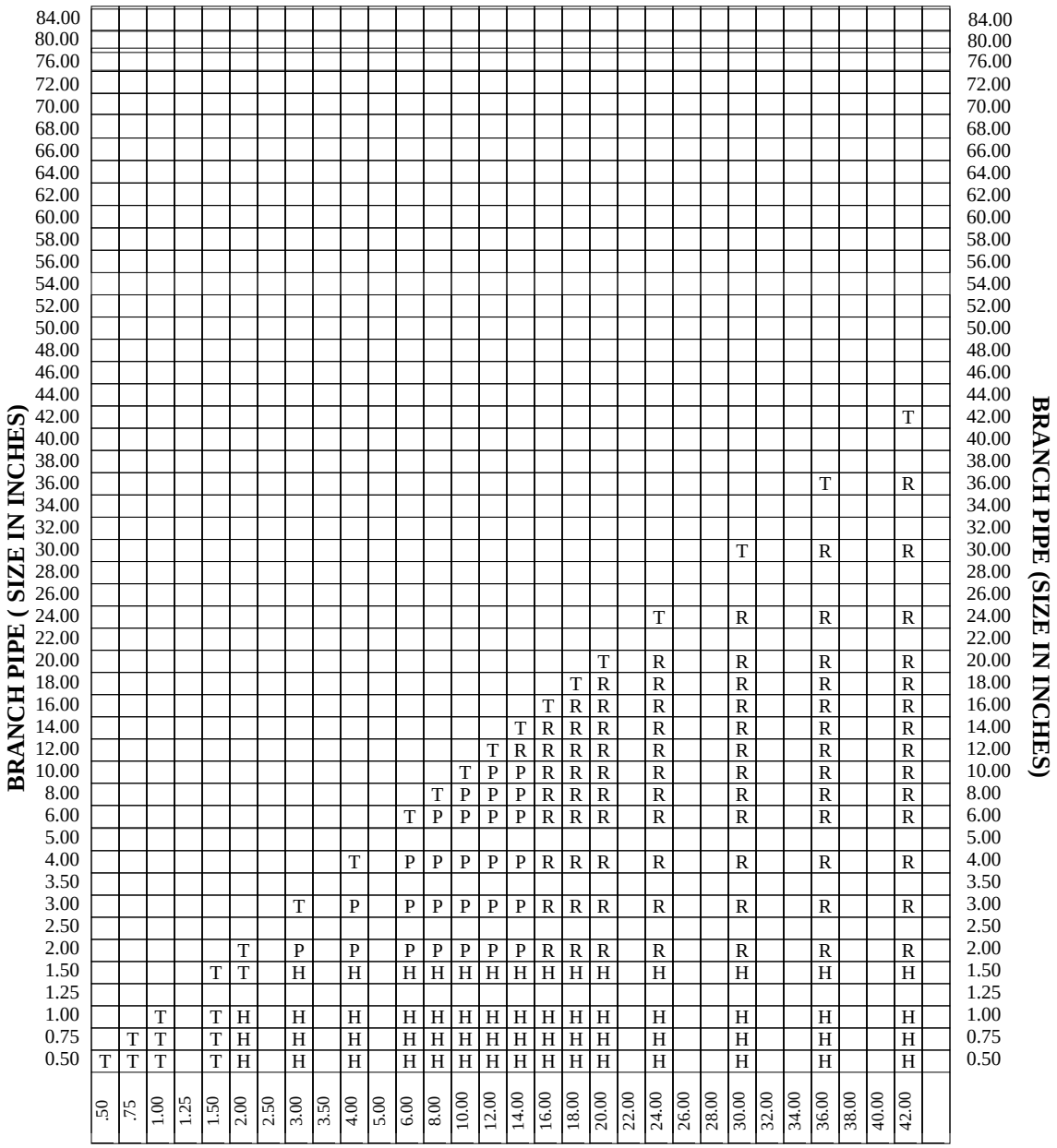
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EIL STD.7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B84A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	1.5	STD	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	30	30	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	36	36	S30	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	42	42	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	48	48	CALC	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP/1	PIPE	.75	.75	XS	B-36.10	ASTM A 106 GR.B	SCRM, SEAMLESS	PI21997Z0	
NIP/	NIPPLE	.75	.75	XS	B-36.10	ASTM A 106 GR.B	TBE, SEAMLESS	PN219E7Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.WN	30	48	M	B-16.47-A	ASTM A 105	300, RF/125AARH	FWA0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FLB	FLNG.BLIND	30	48		B-16.47-A	ASTM A 105	300, RF/125AARH	FBA0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YES02D2Z0	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YLS02D2Z0	311
Valves Group									
GAV	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510LE	510LEZZZ0	615
GAV	VLV.GATE	1	2		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514LE	514LEZZZ0	615
GAV	VLV.GATE	2.5	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514NB	514NBZZZ0	615
GAV/1	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 510NB	510NBZZZ0	340,615
GLV	VLV.GLOBE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520LE	520LEZZZ0	615
GLV	VLV.GLOBE	1	2		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524NB	524NBZZZ0	615
GLV	VLV.GLOBE	2.5	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524LE	524LEZZZ0	615
CHV	VLV.CHECK	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,SEAT: VITON O-RING	SCRF, 800, 3000, B-1.20.1, SHT NO.- 530NA	530NAZZZ0	615
CHV	VLV.CHECK	1	1.5		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS 316; DISK SEAT- VITON O RING	WAF, 300, B-16.5, RF/125AARH, SHT NO.- 534LE	534LEZZZ0	615
CHV	VLV.CHECK	2	24		API-594	BODY-ASTM A 216 GR.WCB,TRIM-INCONEL;DISK	WAFL, 300, B-16.5, WAF/125AARH, SHT NO.- 534TC	534TCZZZ0	588,615

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B84A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						SEAT-DI+PTFE			
CHV/2	VLV.CHECK	1	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,SEAT: PTFE O-RING	WAF, 300, B-16.5, SHT NO.- 534NB	534NBZZZ0	976,615
CHV/1	VLV.CHECK	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,SEAT: PTFE O-RING	SCRF, 800, 3000, B-1.20.1, SHT NO.- 530LE	530LEZZZ0	976,615
BLV	VLV.BALL	.75	.75		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,BALL-SS316; SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540LE	540LEZZZ0	347,615
BLV	VLV.BALL	3	10		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL+SEAT-SS316+RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544LE	544LEZZZ0	615
BLV/3	VLV.BALL	3	10		API-608	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	FLGD, 300, B-16.5, SHT NO.- 544NB	544NBZZZ0	615
Bolt Group									
BOS	BOLT.STUD	.5	42		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	20		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
GAS	GASKET	24	24		B-16.20-ANSI B16.5	316S.S. 3-PLY CORRUGTED GASKET	DBLEJKT, 300	GK6BI14Z0	386
GAS	GASKET	30	48		B-16.20-ANSI B16.47A	316S.S. 3-PLY CORRUGTED GASKET	DBLEJKT, 300	GK4BI14Z0	386
Trap/Strainer Group									
PSR	STRNR.PERM	.75	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	637
PSR	STRNR.PERM	2	24		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 300,RF/125AARH, SMGR/MAX125AARH	SP38055B0	639

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 1 of 6

PIPE CLASS : **B86A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	52.02	52.02	47.8	46.05	44.64

SERVICE

REACTOR PRODUCT DISCHARGE-PRODUCT CONVEYING (BASED ON LICENSOR PMS CLASS - 1E64)

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 20.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

308 ALL PRESSURE RESISTING BUTT WELDS SHALL BE 100% RADIOGRAPHED AS PER B31.3. ALL OTHER WELDS SHALL BE LP/MP EXAMINED AS PER B31.3. WHEN SPECIFICALLY APPROVED ULTRASONIC EXAMINATION MAY BE SUBSTITUTED FOR RADIOGRAPHIC, LP/MP EXAMINATION.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

318 BEND RADIUS IN SOLIDS CONVEYING SERVICE MUST BE 9-TIMES NOMINAL SIZE. COMMERCIAL ELBOW SHALL NOT BE USED. FOR BENDS PIPE MATERIAL IS ALSO ACCEPTABLE.

319 PROVIDE WELDED GROUNDING CLIPS AT FLANGED EQUIPMENT AND ON BOTH SIDES OF FLANGED JOINTS.

340 USE FOR VENTAND DRAIN CONNECTION WHERE VALVE IS NORMALLY CLOSED(SW INLET AND SCRD OUTLET) .

347 USE FOR INSTRUMENT CONNECTION WHERE VALVE IS NORMALLY OPEN (SW INLET AND SCRD OUTLET) .

548 SEPARABLE SOCKETS SHALL BE SOCKET WELD TYPE.

549 RUN AN ELECTRICAL CONTINUITY TEST EACH TIME THE PIPEWORK IS ASSEMBLED, AND AT LEAST ONCE A YEAR.

559 DO NOT USE REDUCING FLANGES.

566 SOFT SEATED, SPRING LOADED AXIALLY OPENING DISC CHECK VALVE.

617 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E64

644 FOR BRANCHES BETWEEN 45 AND 90 DEGREES, FABRICATE FROM PIPE USING SET-IN CONSTRUCTION (NOT SET ON) AS PER B31.3 AND USE HEAVIER PIPE WHEN REINFORCEMENT IS INDICATED TO AVOID THE USE OF REINFORCING PADS. ALL WELDS SHOULD BE GROUND TO CREATE A SMOOTH TRANSITION.

645 IF GREATER THAN 7000 THERMAL DISPLACEMENT CYCLES ARE EXPECTED OVER THE SERVICE LIFE, A PIPE FLEXIBILITY ANALYSIS IS REQUIRED TO VERIFY THAT THE EXPECTED STRESSES ARE BELOW 80% OF THE ALLOWABLE STRESSES. OTHERWISE THE PIPING SHOULD BE CONSTRUCTED TO ASME B31.3 SEVERE CYCLIC SERVICE REQUIREMENTS.

646 PIPE BETWEEN THE REACTOR AND THE PRODUCT CHAMBER TO BE SUBJECTED TO FATIGUE ANALYSIS IN ADDITION TO THERMAL ANALYSIS TO DETERMINE IF A THICKNESS ABOVE THAT LISTED FOR PRESSURE IS REQUIRED.

666 PTFE FILLER; FLEXITALLIC STYLE CGI OR EQUAL.

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 2 of 6

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

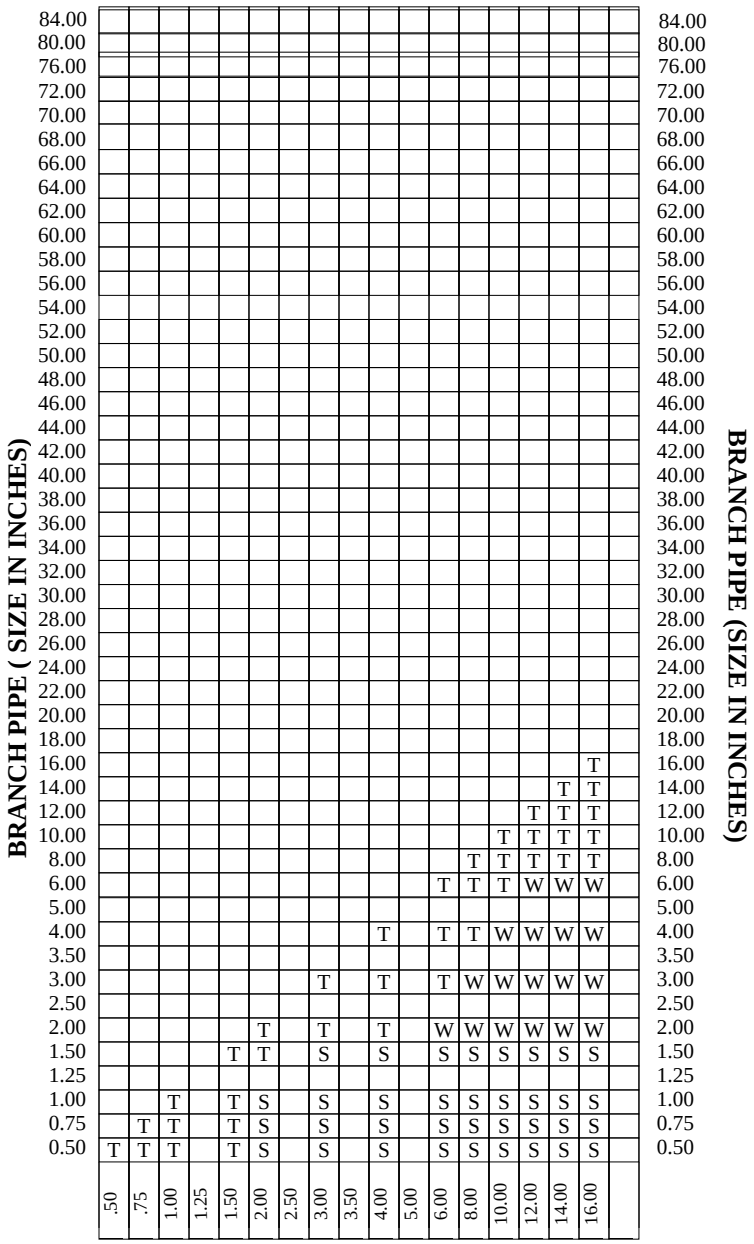
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 3 of 6



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B86A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	STD	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	STD	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	12	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	14	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	318
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	318
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	318
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	318
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	318
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	318
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	318
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	318
BND	PIPE.BEND	.75	1.5	M	ASME B31.3	ASTM A 234 GR.WPB	PE, 9D	WCI6878Z0	318
BND	PIPE.BEND	2	14	M	ASME B31.3	ASTM A 234 GR.WPB	BW, 9D	WCI6848Z0	318
BND	PIPE.BEND	16	16	M	ASME B31.3	ASTM A 234 GR.WPB-W	BW, 9D	WCI7548Z0	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	16	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	
CAP	CAP	2	16	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B86A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
WLT	WELDOLET	2	16	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YES02D2Z0	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YLS02D2Z0	311
Valves Group									
GAV/1	VLV.GATE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510LC	510LCZZZ0	340,617
BLV	VLV.BALL	.5	8		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL-SS316; SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544LC	544LCZZZ0	617
BLV/1	VLV.BALL	.5	.75		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL-SS316;SEAT-RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540LC	540LCZZZ0	347,617
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	16		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 300	GK1DY74Z0	666

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 1 of 7

PIPE CLASS : **B88A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	52.02	52.02	47.45	46.05	44.64	42.18

SERVICE

CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - 1E18)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

308 ALL PRESSURE RESISTING BUTT WELDS SHALL BE 100% RADIOGRAPHED AS PER B31.3. ALL OTHER WELDS SHALL BE LP/MP EXAMINED AS PER B31.3. WHEN SPECIFICALLY APPROVED ULTRASONIC EXAMINATION MAY BE SUBSTITUTED FOR RADIOGRAPHIC, LP/MP EXAMINATION.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

329 USE FOR ONLY 3/4"X1/2" SCRD GLOBE VALVE (GLV/1) TO BE USED FOR VENTS, DRAINS AND INSTRUMENT CONNECTION.

356 AT THREADED EQUIPMENT CONNECTIONS ONLY. SEAL WELD SHALL COVER ALL THREADS.

357 BRANCH CONNECTION SHALL BE LOCATED AT POINTS WHERE THE RUN LINE IS ANCHORED.

538 FOR PISTON TYPE CHECK VALVE

547 LINES SHALL BE RESTRAINED BY USE OF RIGID ANCHORS AND FRICTION PIPE SLIDES (STAUFF CORP. OR EQUAL).

548 SEPARABLE SOCKETS SHALL BE SOCKET WELD TYPE.

576 USE FOR ONLY 3/4" X 1/2" SW GLOBE VALVE (GLV/3) TO BE USED FOR VENT, DRAINS AND INSTRUMENT CONNECTION.

613 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E18

637 REFER LICENSOR SPECIFICATION FOR STR-366 FOR STRAINERS.

663 GRAFOIL GTB OR GTK FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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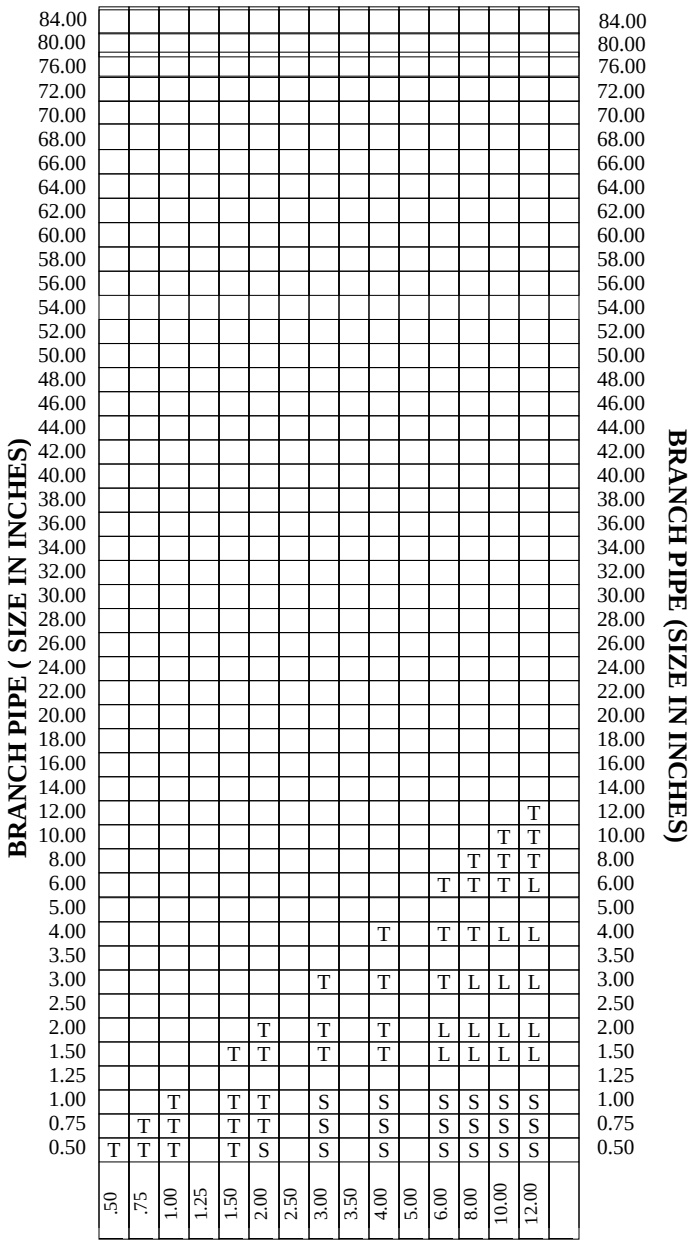
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SW COUPLING	
	1.5" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE. REFER STD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE; REFER STD 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SCRD GLOBE VALVE. REFER STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SCRD GLOBE VALVE TO SPEC AS PER STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B88A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1.5	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	12	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
NIP/	NIPPLE	.75	1	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	356
Flange Group									
FLG	FLNG.SW	.75	1	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	1.5	12	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.75	12		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	1.5	12	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	1.5	12	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1.5	12	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ/2	T.EQUAL	1	1		B-16.11	ASTM A 105	SCRF, 3000	WE60282Z0	329
TEQ/1	T.EQUAL	.75	.75		B-16.11	ASTM A 105	SCRF, 6000	WE60283Z0	329
TRED	T.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1.5	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED/2	T.RED	1	1		B-16.11	ASTM A 105	SCRF, 3000	WR60282Z0	329
TRED/1	T.RED	.75	.75		B-16.11	ASTM A 105	SCRF, 6000	WR60283Z0	329
REDC	REDUC.CONC	2	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	2	12	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.75	1		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	422
CAP	CAP	1.5	12	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.75	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.75	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.75	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	357
SLT	SOCKOLET	1	1		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	357
PLT	SWEEPOLET	1.5	6	M, M	MSS-SP97	ASTM A 105	BW	YPS024ZZ0	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
TLT	THREADOLET	.75	.75		MSS-SP97	ASTM A 105	SCRF, 6000	YTS0283Z0	329
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
GAV	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510LA	510LAZZZ0	613
GAV	VLV.GATE	1	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514ME	514MEZZZ0	613
GAV	VLV.GATE	2	12		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514LA	514LAZZZ0	613
GLV	VLV.GLOBE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520LA	520LAZZZ0	613
GLV	VLV.GLOBE	1	2		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524ME	524MEZZZ0	613
GLV	VLV.GLOBE	3	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524LA	524LAZZZ0	613
GLV/3	VLV.GLOBE	.75	.75		BS EN ISO 15761	BODY-ASTM A 105,TRIM -SS316	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 520VC	520VCZZZ0	576,613
GLV/1	VLV.GLOBE	.75	.75		BS EN ISO 15761	BODY-ASTM A 105,TRIM-SS 316	SPCL, 800, 6000, B-16.11, REFER VMS SHT, SHT NO.- 520ME	520MEZZZ0	329,613
CHV	VLV.CHECK	.75	.75		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530LA	530LAZZZ0	538,613
CHV	VLV.CHECK	1	1.5		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	WAFL, 300, B-16.5, WAF/125AARH, SHT NO.- 534ME	534MEZZZ0	613
CHV	VLV.CHECK	2	12		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS316;DISK SEAT-DI+METAL	WAFL, 300, B-16.5, WAF/125AARH, SHT NO.- 534TA	534TAZZZ0	613
BLV	VLV.BALL	.75	1		BS EN ISO 17292	BODY-ASTM A 105,BALL + SEAT: 4130+CR2C3	SW, 800, 3000, B-16.11, SHT NO.- 540LA	540LAZZZ0	613
Bolt Group									
BOS	BOLT.STUD	.75	12		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	

Package : IPMCS
Report No. : 50

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Location BINA, MADHYA PRADESH	**Pipe Class :B88A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.75	12		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 300	GK66374Z0	663
Trap/Strainer Group									
PSR	STRNR.PERM	.75	1		MNF'STD	B:A216GR.WCB;INT:SS304	SW, Y-TYPE, 800	SP380D510	637

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 1 of 7

PIPE CLASS : **B89A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	165
PRESS	47.45	47.45	45.34

SERVICE

CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E87)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

123 PIPING WITH THICKNESS>12.7 SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

308 ALL PRESSURE RESISTING BUTT WELDS SHALL BE 100% RADIOGRAPHED AS PER B31.3. ALL OTHER WELDS SHALL BE LP/MP EXAMINED AS PER B31.3. WHEN SPECIFICALLY APPROVED ULTRASONIC EXAMINATION MAY BE SUBSTITUTED FOR RADIOGRAPHIC, LP/MP EXAMINATION.

309 SPECIAL CARE SHALL BE EXERCISED DURING FABRICATION OF PIPING TO MINIMIZE OBSTRUCTIONS TO FLOW. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO ASSEMBLY OF SW JOINTS. WHEREVER POSSIBLE, INSIDE OF WELDS SHALL BE GROUND FLUSH. ALL INTERNAL SPLLATER SHALL BE REMOVED. (CONTD.)

310 ALL WELDS INACCESSIBLE FOR GRINDING, THE FIRST PASS SHALL BE MADE BY THE GTAW PROCESS OR CONSUMABLE INSERTS SHALL BE USED. ALL HOLES FOR "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE. REMOVE ALL BURRS LEFT AFTER CUTTING.

311 USE FOR ONLY THERMOWELL CONNECTION.

320 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION. DO NOT USE IN-LINE FOR CONVEYING.

340 USE FOR VENTAND DRAIN CONNECTION WHERE VALVE IS NORMALLY CLOSED(SW INLET AND SCRD OUTLET) .

347 USE FOR INSTRUMENT CONNECTION WHERE VALVE IS NORMALLY OPEN (SW INLET AND SCRD OUTLET) .

396 316 STAINLESS STEEL 3-PLY CORRUGATED GASKET SIMILAR TO LAMONS STYLE 340, MELRATH 1900, FLEXITALLIC 129 OR EQUAL. CORRUGATED JACKETED METAL GASKET WITH CORRUGATED METAL FILLER (CORE). PITCH OF CORRUGATIONS TO BE 3/16"; JACKET MATERIAL TO BE 0.019" THICK, FILLER MATERIAL TO BE 1/32" THICK.(CONTD.)

397 DESIGN SEATING STRESS (Y)= 6500 PSIG AND GASKET FACTOR (M)= 3.5. BOTH THE SIDES OF 3-PLY CORRUGATED GASKET TO BE FURNISHED WITH ONE LAYER OF 0.015" THICK GRAFOIL GRADE GTH (DONT SUBSTITUTE) ADHESIVE BACKED TAPE(CONT.).

400 TAPE SHALL PROVIDE COMPLETE COVERAGE OF THE CONTACT AREA OF THE INSTALLED GASKET WITH MINIMUM NO. OF JOINTS HAVING AN OVERLAP NOT EXCEEDING 1/16". TAPE SHALL BE INSTALLED IN ACCORDANCE WITH RECOMMENDATIONS OF GRAFTECH, INC. TECH BULLETIN G-202.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

587 4-WAY BALL VALVE

618 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1E87

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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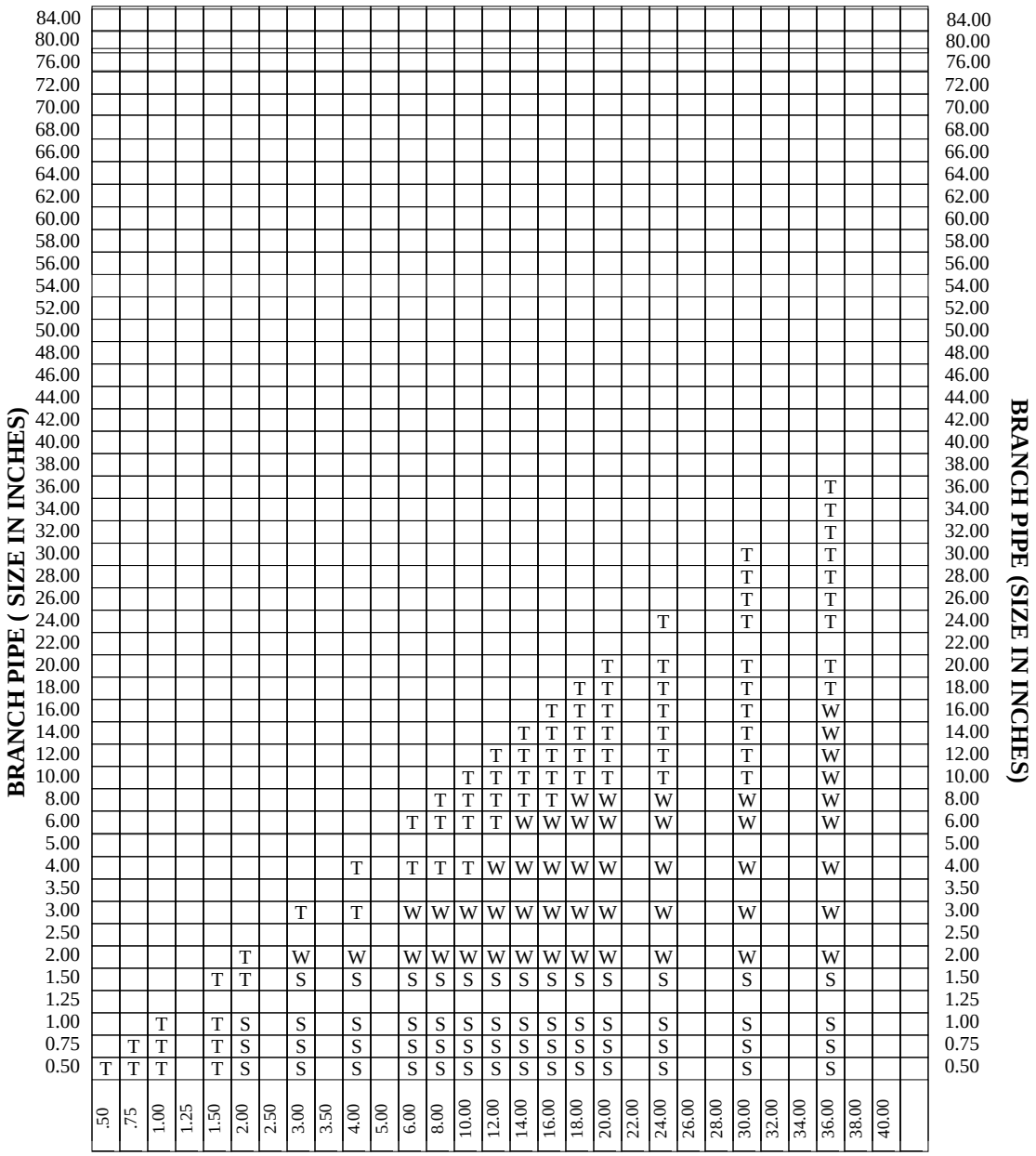
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Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 2 of 7

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B89A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	1.5	STD	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	14	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	18	18	S30	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	20	24	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	30	30	S30	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	36	36	S40	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	42	42	CALC	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	48	48	CALC	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.WN	30	48	M	B-16.47-A	ASTM A 105	300, RF/125AARH	FWA0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FLB	FLNG.BLIND	30	48		B-16.47-A	ASTM A 105	300, RF/125AARH	FBA0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
FEF	SPCR&BLND	30	48		ASME B16.47A/EIL' STD	ASTM A 105	300, FF/125AARH	FCW0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	2	16	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	18	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	16	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	18	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	422
CAP	CAP	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	16	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
O'let Group									
SLT	SOCKOLET	.5	.75		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z0	
WLT	WELDOLET	2	20	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YES02D2Z0	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YLS02D2Z0	311
Valves Group									
GAV	VLV.GATE	.5	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510LD	510LDZZZ0	618
GAV	VLV.GATE	1	2		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514LD	514LDZZZ0	618
GAV	VLV.GATE	3	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514NA	514NAZZZ0	618
GAV/1	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510NA	510NAZZZ0	320,618
GLV	VLV.GLOBE	.5	.75		BS EN ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520LD	520LDZZZ0	618
GLV	VLV.GLOBE	1	2		BS-1873	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524LD	524LDZZZ0	618

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B89A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	2.5	12		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316L	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524NA	524NAZZZ0	618
CHV	VLV.CHECK	.75	.75		API 602/ ISO 15761	BODY-ASTM A 105,SEAT: VITON O-RING	SCRF, 800, 3000, B-1.20.1, SHT NO.- 530NA	530NAZZZ0	618
CHV	VLV.CHECK	1	1.5		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SS 316;DISK SEAT - VITON O RING	WAF, 300, B-16.5, RF/125AARH, SHT NO.- 534LD	534LDZZZ0	618
CHV	VLV.CHECK	2	24		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-PTFE	WAF, 300, B-16.5, WAF/125AARH, SHT NO.- 534TB	534TBZZZ0	618
BLV	VLV.BALL	.75	.75		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,BALL + SEAT-SS316+RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540LD	540LDZZZ0	618
BLV	VLV.BALL	3	10		BS EN ISO 17292	BODY-ASTM A 216 GR.WCB,BALL+ STEM-SS316 +RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 544LD	544LDZZZ0	618
Bolt Group									
BOS	BOLT.STUD	.5	48		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
GAS	GASKET	30	48		B-16.20-ANSI B16.47A	316S.S. 3-PLY CORRUGTED GASKET	DBLEJKT, 300	GK4BI14Z0	396

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B92K** Sheet 1 of 5

PIPE CLASS : **B92K**
RATING : 300
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	50.5	50.5	42.18	37.96	34.8

SERVICE

LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

51 DESIGN PRESSURE AT -29 DEG.C. AND 38 DEG.C. FOR THIS PRESSURE HAS BEEN REDUCED FROM 50.62 KG/CM2G TO 50.50 KG/CM2G TO OPTIMISE THE THICKNESS FOR 6" SIZE.

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

105 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE HOT DIP GALVANISED A453 GR.660 CL.A

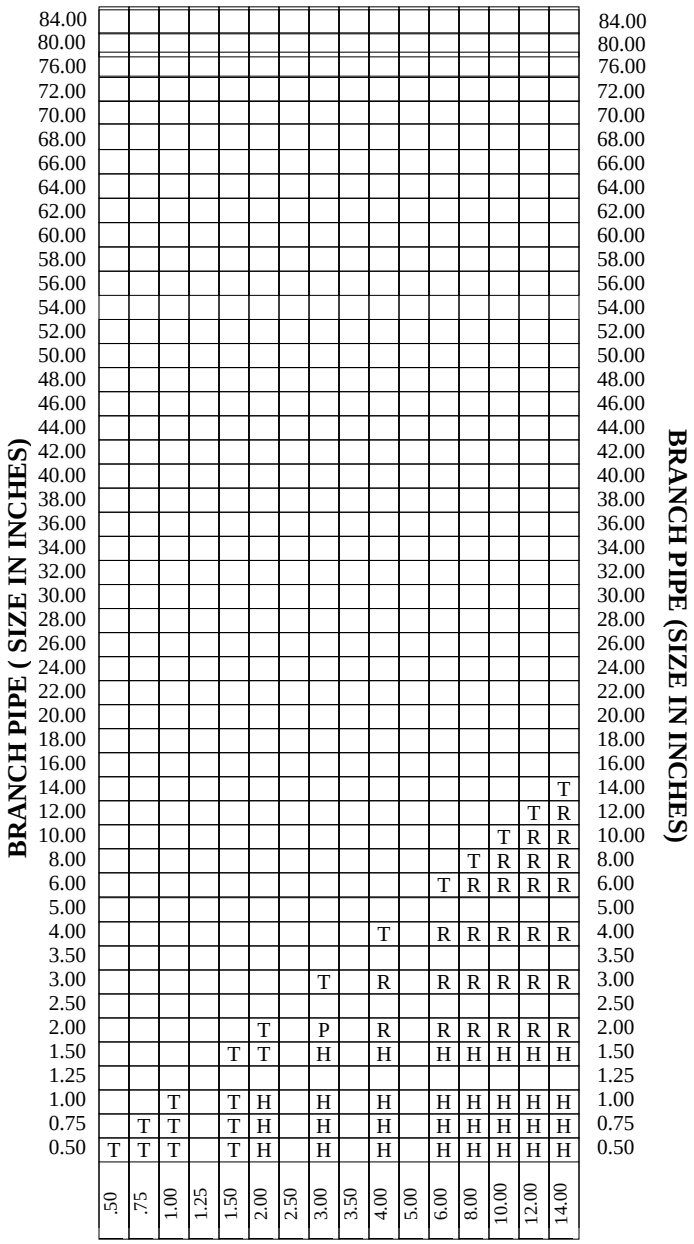
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B92K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B92K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B92K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	4	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	6	6	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	51
PIP	PIPE	8	8	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	10	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	12	12	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	14	14	7.92	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B92K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51061	51061ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51461	51461ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52061	52061ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B92K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52461	52461ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53061	53061ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53461	53461ZZZ0	
BLV	VLV.BALL	.5	16		BS-5351	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54461	54461ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	48
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A240TP316;INT:SS316	CONETYPE, 300,FF/125AARH, RTJ/63AARH	ST14239Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F316;INT:SS316	SW, Y-TYPE, 800	SP308D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403WP316-S;INT:SS316	BW, T-TYPE	SP15744Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403WP316-WX;INT:SS316	BW, T-TYPE	SP15844Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B99A** Sheet 1 of 4

PIPE CLASS : **B99A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93
PRESS	52.02	52.02	47.8

SERVICE

CAUSTIC (STRESS RELIEVED ZONE), SODIUM HYDROXIDE
HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 20%~50% AT TEMP. 93 DEG.C ~ 45 DEG.C)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

42 ALL WELDS SHALL BE STRESS RELIEVED.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

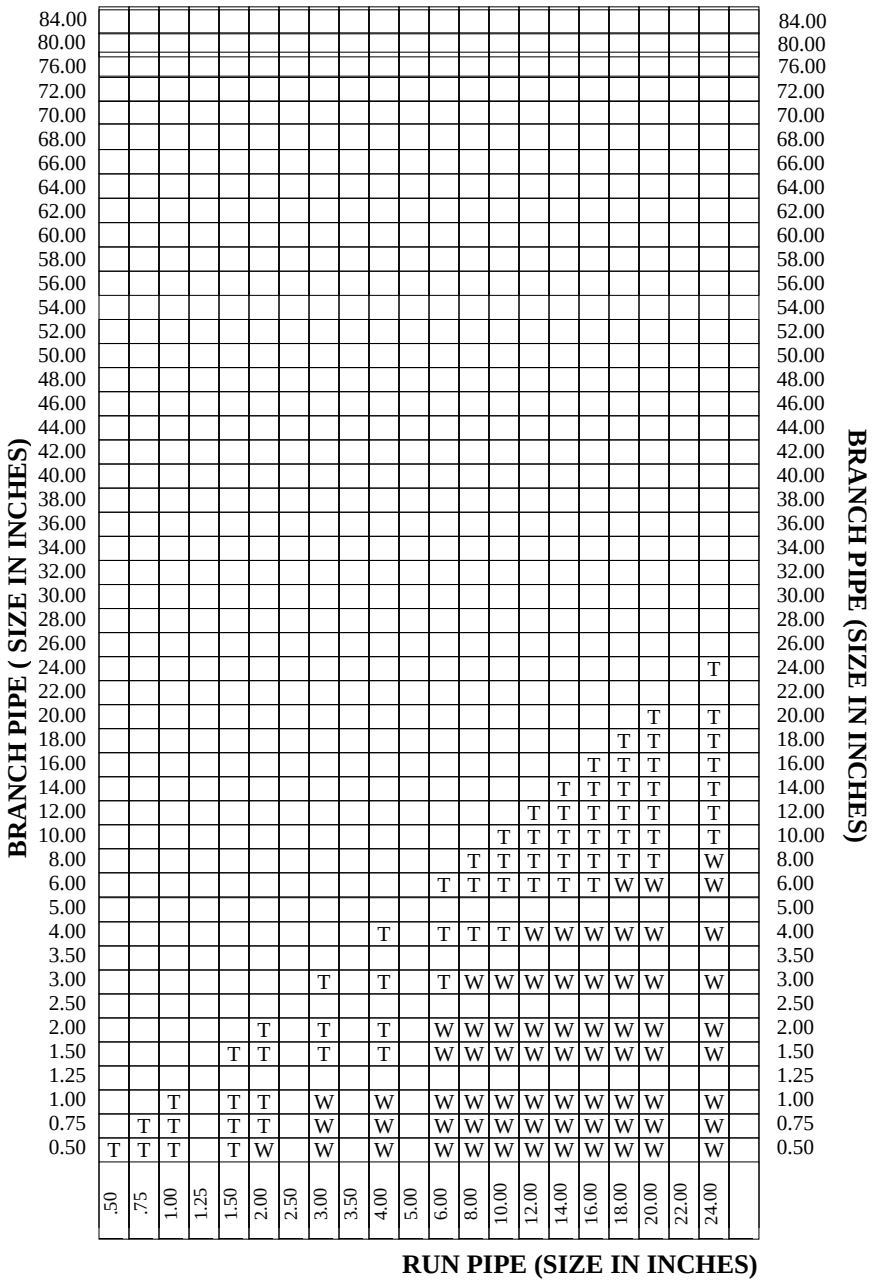
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B99A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B99A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B99A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	12	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	
PIP	PIPE	18	18	XS	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
PIP	PIPE	20	20	14.0	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
PIP	PIPE	24	24	16.0	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	32
NIP/	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B99A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
CAP	CAP	.5	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
O'let Group									
WLT	WELDOLET	.5	8	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.5	24		API 600/ ISO 10434	BODY-ASTM A 105 / A 216GR.WCB,TRIM-MONEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 514DA	514DAZZZ0	
GLV	VLV.GLOBE	.5	12		BS-1873	BODY-ASTM A 105 / A 216GR.WCB,TRIM-MONEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 524DA	524DAZZZ0	
CHV	VLV.CHECK	.5	24		BS-1868	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 534DA	534DAZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 1 of 7

PIPE CLASS : **B9A**
RATING : 300
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.8	46.05	44.64	42.53	40.07	38.66	37.26	35.5	28.82

SERVICE

MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP,
DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, ETC. HYDROCARBON,QUENCH OIL, PROCESS WATER, FUEL OIL

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

113 PIPE THICKNESS HAS BEEN CALCULATED ON ACTUAL LINE CONDITION [38.5 KG/CM2 @ 200 DEG.C] SUBJECTED TO MIN. OF 80% OF THE CLASS CONDITIONS.

114 PIPE THICKNESS HAS BEEN CALCULATED BASED ON THE LINE CONDITION 26 KG/CM2 @ 225 DEG.C

132 PIPE THICKNESS HAS BEEN CALCULATED BASED ON ACTUAL LINE CONDITION [38.5 KG/CM2 @ 200 DEG.C]

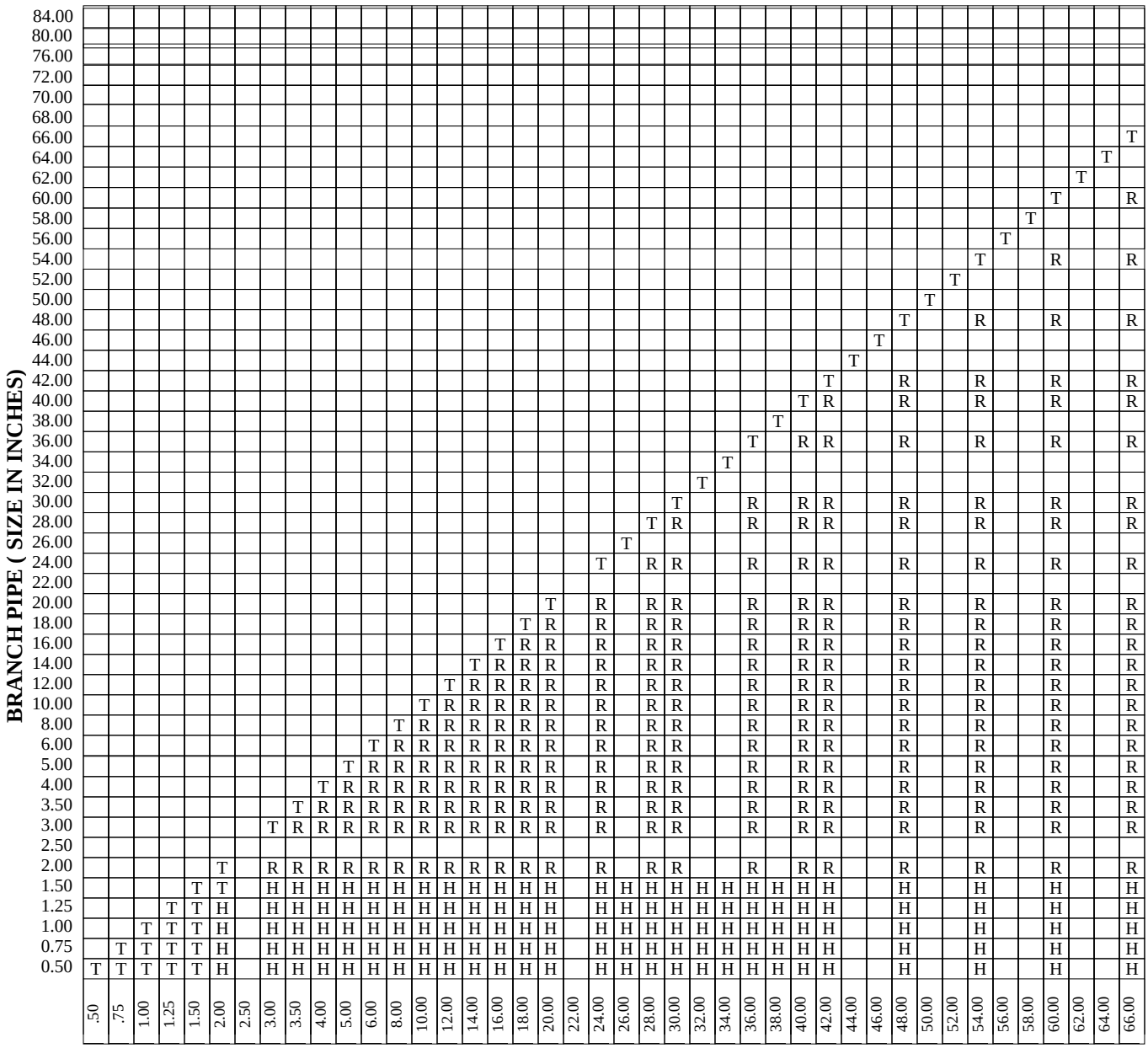
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 2 of 7



RUN PIPE (SIZE IN INCHES)

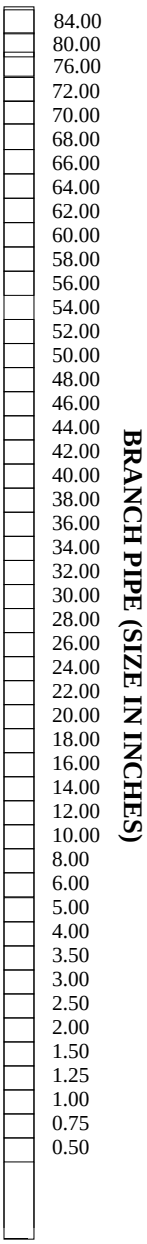
CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

B9A

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 3 of 7



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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 4 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	10	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	12	14	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	16	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	18	18	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	20	20	S40	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	
PIP	PIPE	24	24	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	113,32
PIP	PIPE	28	28	S30	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	113,32
PIP	PIPE	30	30	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	113
PIP	PIPE	36	36	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	113
PIP	PIPE	40	40	22.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	132
PIP	PIPE	42	42	22.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	132
PIP	PIPE	48	48	24.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	132,32
PIP	PIPE	54	54	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	114
PIP	PIPE	60	60	22.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	114
PIP	PIPE	66	66	24.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	114
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.WN	26	60	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	

Package : IPMCS
Report No. : 50

B9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 5 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Flange Group									
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FLB	FLNG.BLIND	26	60		B-16.47-B	ASTM A 105	300, RF/125AARH	FBB0147Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
FEF	SPCR&BLND	26	60		EIL'STD	ASTM A 105	300, FF/125AARH	FCE0141Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB90	ELBOW.90	52	66	M	JOB'STD	ASTM A 234 GR.WPB	BW, 1.5D	WAM684Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	52	66	M	JOB'STD	ASTM A 234 GR.WPB	BW, 1.5D	WBM684Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	48	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 6 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	48	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	48	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51401	51401ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52401	52401ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :B9A** Sheet 7 of 7

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53401	53401ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54401	54401ZZZ0	
PLV	VLV.PLUG	.5	24		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 55401	55401ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	66		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
GAS	GASKET	26	60		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS	GASKET	66	66		JOB'STD	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GKF6274Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 300,FF/125AARH	ST16839Z0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1A** Sheet 1 of 5

PIPE CLASS : **D1A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	104.05	104.05	95.6	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58

SERVICE

NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABL AND NON LETHAL - PETROLEUM PRODUCTS: FO. FG, SWEET GAS, INHIBITOR SOLUTION, NH3, BRINE (MINUS 10 DEG C), CO2, CAUSTIC SODA (20 BE MAX & TEMP 70 DEG C MAX), PARAXYLENE, BITUMEN, ETHYLENE, DONOR, VAPORIZED PROPYLENE, HIGH PRESSURE PURIFIED NITROGEN.

NOTES

1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

965 FOR LICENSOR SPECIFICATION LGP56 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-366 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

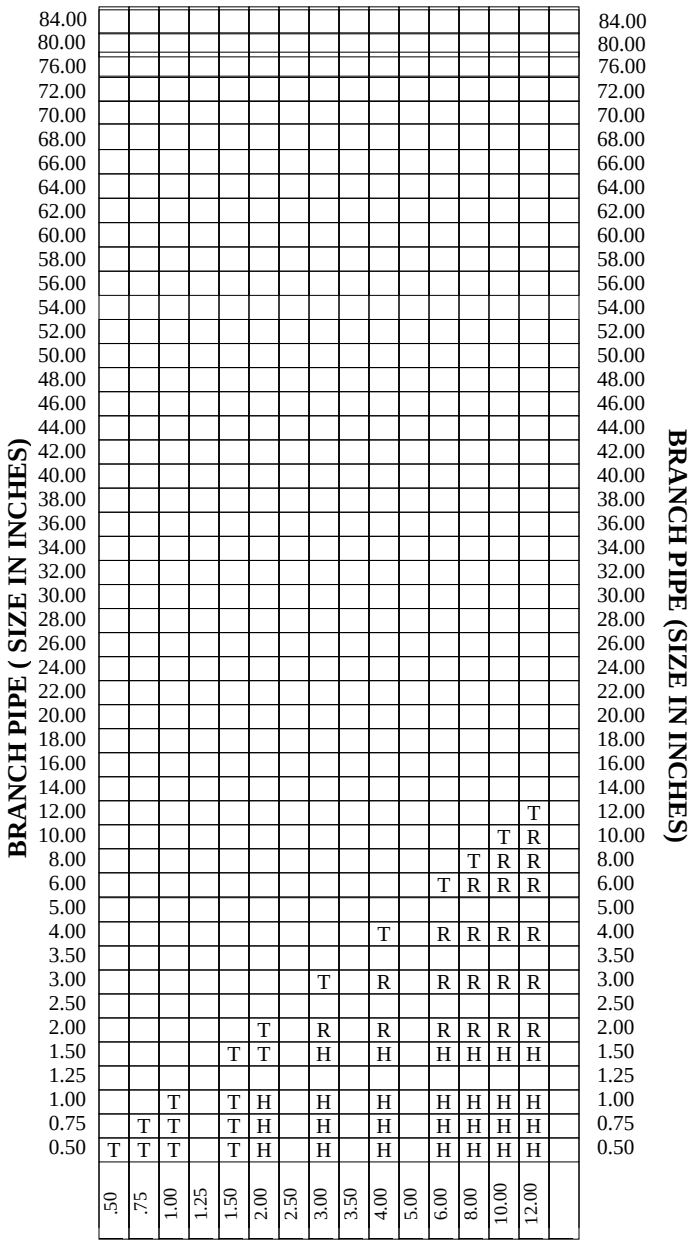
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D1A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	4	8	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	10	12	S80	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	26
PIP	PIPE	14	14	CALC	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	3
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	600, FF/125AARH	FCK0161Z0	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	

Package : **IPMCS**
Report No. : **50**

D1A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51501	51501ZZZ0	
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52501	52501ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53501	53501ZZZ0	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SEAT-RPTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 54501	54501ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 600,FF/125AARH	ST1683IZ0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1K** Sheet 1 of 5

PIPE CLASS : **D1K**
RATING : 600
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454
PRESS	101.24	101.24	84.36	75.57	69.95	65.38	62.21	60.8	59.4	57.99	56.94	55.54

SERVICE

PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON
- FLAMMABLE/NON-FLAMMABLE & NON-LETHAL
HYDROCARBONS, CHEMICALS ETC.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

48 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE A453 GR.660 CL.A

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

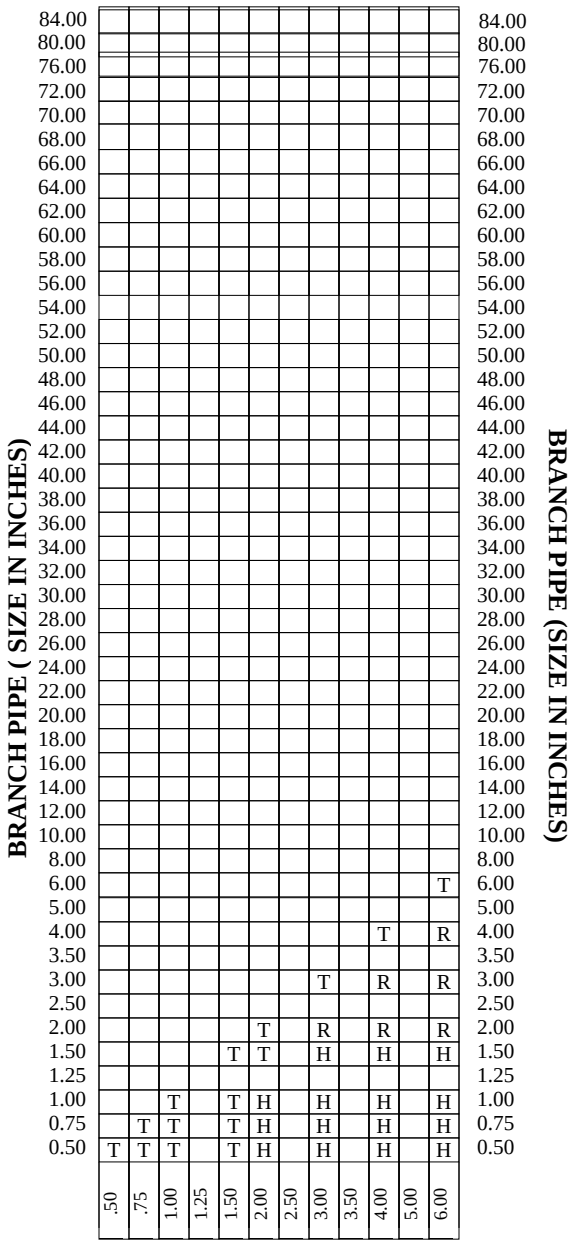
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1K** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D1K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2	6	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	8	8	CALC	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10	24	CALC	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FSC4167Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FWC4167Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FBC4167Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	600, FF/125AARH	FGK4161Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	600, FF/125AARH	FCK4161Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51045	51045ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51545	51545ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52045	52045ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF8,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52545	52545ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53045	53045ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8,TRIM-	FLGD, 600, B-16.5, RF/125AARH, SHT	53545ZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D1K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED	NO.- 53545		
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8 / ASTM A 182 GR.F304,TRIM-SEAT-RPTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 54545	54545ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	48
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A240TP304;INT:SS304	CONETYPE, 600,FF/125AARH	ST1413IZ0	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F304;INT:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2	8	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10	24	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D20K** Sheet 1 of 5

PIPE CLASS : **D20K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	101.3	101.3	85.2	75.6

SERVICE

T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - L7E28)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

346 SAFEGUARD AND SUPPORT NPS 0.5" PIPING IN STRUCTURAL CHANNEL MATERIAL.

703 NPS 1/2 PIPING IS USED FOR MANY ALKYL LINES SO THE INTERNAL CONTAINED VOLUME IS SMALL. THESE SMALL LINES LACK THE MECHANICAL STRENGTH NECESSARY TO SUPPORT THEMSELVES ACROSS LONG SPANS (AS IN A PIPE RACK) OR TO PROVIDE PROTECTION FROM MECHANICAL DAMAGE FROM IMPACT.

704 (CONTINUED FROM NOTE 703) LONG RUNS IN THE PIPE RACKS AND PIPING THAT ARE POTENTIALLY EXPOSED TO MECHANICAL IMPACT NEED TO BE PROTECTED BY STEEL CHANNEL WITH A STRENGTH EQUAL OR GREATER THAN 4 INCH WIDTH AND WEIGHT PER FOOT OF NO LESS THAN 7.4.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

708 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE JOINT COMPOUND WHERE SEAL WELDING, AND COVER ALL EXPOSED THREADS WITH WELD.

709 FLANGES SHOULD BE USED ONLY AT EQUIPMENT OR VALVES. FOR LONG LINES USE SOCKET WELDING COUPLINGS (TO JOIN PIPE) FOR NPS 1/2 TO 1-1/2, BUTT WELD FOR NPS 2" AND ABOVE.

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

714 FOR PRESSURE GUAGE ASSEMBLY: FOR ALKYL SERVICE, CHEMICAL ATTACHMENTS ARE TO BE USED. DIAPHRAGM IS TO BE CONSTRUCTED OF 304 STAINLESS STEEL AND WELDED TO THE TOP HOUSING. FLUSH CONNECTION IS TO BE PROVIDED. REFER TO TYPICAL SKETCH NUMBER 26 IN THE SUPPLEMENT TO PROCESS PARTS.

715 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC. WELDED VALVES ARE PREFERRED TO MINIMIZE THE NUMBER OF POTENTIAL LEAK POINTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

722 BALL VLV, B16.34; 1000 PSI; SW; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7; 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

724 VALVE FIRE TESTED TO API 607

725 REDUCED PORT TYPE

727 BALL VLV, ASME B16.34; 1000 PSI; SOCKET WELD END X NPTF; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; REDUCED PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A 193 GR B7, 316 SS STEM; SEATING: REINFORCED OR MOLECULARLY ENHANCED PTFE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; OPERATOR: LEVER

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

729 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2. FOR SIZE RANGE 0.5" TO 1.5": STR-366 & FOR 2": STR-354 IS TO BE FOLLOWED

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730 USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

829 CAST; XS;WAFER INSERT TYPE; PTFE SEAT;SS316 SPRING; REQUISITIONER MUST SPECIFY CRACKING PRESSURE; FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG; CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150/ CLASS 300/ CLASS 600 FLANGES;TO BE USED WITH XS OR THINNER WALL PIPE

830 ASME B16.34/16.10 SHORT PATTERN; CAST; REDUCED PORT TYPE; END ENTRY; SS316 STEM; SEATING: MOLECULARLY ENHANCED PTFE; SS316 BALL; PACKING: FLEXIBLE GRAPHITE-PTFE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER; SELF-RELIEVING SEATS ONLY; DO NOT DRILL BALL

831 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; CARBON STEEL; ASTM A 105; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A

902 LICENSOR PMS L7E28 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

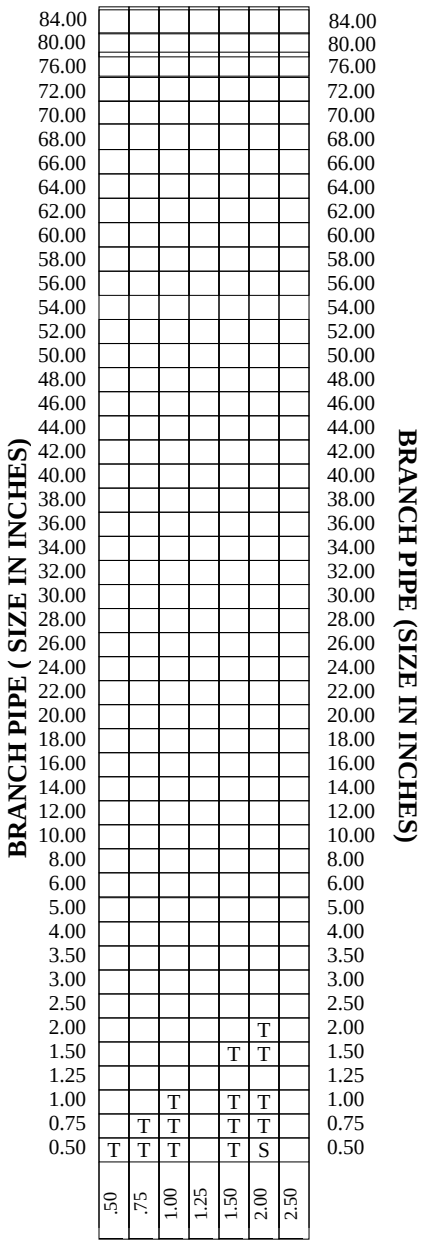
988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-902	
	ON LINES >= 2.0"	NOTE-902	
VENTS	ON LINES <= 1.5"	NOTE-902	
	ON LINES >= 2.0"	NOTE-902	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-902)	
PRESS.CONN	0.75"	NOTE-902	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D20K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	2	2	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP/1	PIPE	.5	.5	7.47	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	710
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FSCD867Z0	709
FLG	FLNG.WN	.5	.5	160S	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FWCD867Z0	709
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FWCD867Z0	709
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FBCD867Z0	709
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 182 GR.F304/304L	600, FF/125AARH	FGKD861Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	

Package : IPMCS
Report No. : 50

D20K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	
O'let Group									
SLT	SOCKOLET	.5	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
Valves Group									
CHV	VLV.CHECK	.5	1		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530YA	530YAZZZ0	831,715
CHV	VLV.CHECK	1.5	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535YA	535YAZZZ0	829,705, 715
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 545ZA	545ZAZZZ0	722,715, 720,721, 724,725
BLV	VLV.BALL	2	2		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545YA	545YAZZZ0	830,715, 724,730
BLV/1	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SPCL, 1000, 3000, B-16.11, REFER VMS SHT, SHT NO.- 545KA	545KAZZZ0	727,715, 720,721, 724,728
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 600	GK69776Z0	731

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Location BINA, MADHYA PRADESH	**Pipe Class :D20Q** Sheet 1 of 4

PIPE CLASS : **D20Q**
RATING : 600
BASE MATERIAL : INCONEL 600
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	105.46	105.46	105.46	102.3	99.13	93.51	85.07	82.61	79.8	74.87	71.36	68.55	63.27	50.97
	538													
	33.74													

SERVICE

HIGH PRESSURE STEAM

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

185 VERMICULITE FILLER OR AMORPHOUS POLYSILIC ACID FIBRES WITH TALC FILLER.

234 GASKET SHALL BE SPIRAL WOUND TYPE.

236 ALL ALLOY UNS N06600 MATERIAL SHALL BE SUPPLIED IN ANNEALED CONDITION.

238 EACH CASTING SHALL MEET THE HYDROSTATIC TEST REQUIREMENTS OF ASTM SPECIFICATION A 703.

240 NO ELASTOMERIC COMPONENTS SHALL BE ALLOWED IN THE VALVES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE AS PER EIL STD 7-44-0354	

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BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	3.00	
84.00									84.00
80.00									80.00
76.00									76.00
72.00									72.00
70.00									70.00
68.00									68.00
66.00									66.00
64.00									64.00
62.00									62.00
60.00									60.00
58.00									58.00
56.00									56.00
54.00									54.00
52.00									52.00
50.00									50.00
48.00									48.00
46.00									46.00
44.00									44.00
42.00									42.00
40.00									40.00
38.00									38.00
36.00									36.00
34.00									34.00
32.00									32.00
30.00									30.00
28.00									28.00
26.00									26.00
24.00									24.00
22.00									22.00
20.00									20.00
18.00									18.00
16.00									16.00
14.00									14.00
12.00									12.00
10.00									10.00
8.00									8.00
6.00									6.00
5.00									5.00
4.00									4.00
3.50									3.50
3.00								T	3.00
2.50									2.50
2.00						T		P	2.00
1.50					T	T		H	1.50
1.25									1.25
1.00			T		T	H		H	1.00
0.75		T	T		T	H		H	0.75
0.50	T	T	T		T	H		H	0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D20Q

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Location BINA, MADHYA PRADESH	**Pipe Class :D20Q** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	CALC	B-36.19	ASTM B 167 (UNS N06600)	PE, SEAMLESS	PI3C877Z1	
PIP	PIPE	2	3	CALC	B-36.19	ASTM B 167 (UNS N06600)	BE, SEAMLESS	PI3C817Z1	
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM B 167 (UNS N06600)	PBE, SEAMLESS	PN3C867Z1	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM B 564 (UNS N06600)	600, RF/125AARH	FSC7367Z1	236
FLG	FLNG.WN	2	3	M	B-16.5	ASTM B 564 (UNS N06600)	600, RF/125AARH	FWC7367Z1	236
FLB	FLNG.BLIND	.5	3		B-16.5	ASTM B 564 (UNS N06600)	600, RF/125AARH	FBC7367Z1	236
FEF	FLNG.FIG.8	.5	3		ASME-B16.48	ASTM B 564 (UNS N06600)	600, FF/125AARH	FGK7361Z1	236
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WA6D9D2Z1	
ELB90	ELBOW.90	2	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW, 1.5D	WAGC94Z11	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WB6D9D2Z1	
ELB45	ELBOW.45	2	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW, 1.5D	WBGC94Z11	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WE6D9D2Z1	
TEQ	T.EQUAL	2	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WEGC94ZZ1	
TRED	T.RED	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WR6D9D2Z1	
TRED	T.RED	2	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WRGC94ZZ1	
REDC	REDUC.CONC	2	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WUGC94ZZ1	
REDE	REDUC.ECC	2	3	M, M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WVGC94ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM B 564 (UNS N06600)	PBE	WNHD96ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM B 564 (UNS N06600)	PBE	WPHD96ZZ1	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	2	3	M	B-16.9	ASTM B 366 GR.WPNCI-S(N06600)	BW	WFGC94ZZ1	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WJ6D9D2Z1	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WK6D9D2Z1	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WL6D9D2Z1	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM B 564 (UNS N06600)	SW, 3000	WM6D9D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-ALLOY 600 (UNS N06600)	SW, 800, 3000, B-16.11, SHT NO.-510DU	510DUZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-ALLOY 600 (UNS N06600)	SW, 800, 3000, B-16.11, SHT NO.-520DU	520DUZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A494 GRADE CY40 CLASS 2,TRIM-ALLOY 600 (UNS N06600)	SW, 800, 3000, B-16.11, SHT NO.-530DU	530DUZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	3		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	3		B-16.20-ANSI B16.5	UNS N06600+VRMICULITE+N06600IR	SPIRAL, 300	GK6EU74Z0 / 234	185

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D21K** Sheet 1 of 6

PIPE CLASS : **D21K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	101.2	101.2	87.2	78.7	72.1	67.1	63.3	62.6	61.2	60.1	59.4

SERVICE

HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - L7G7)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

721 THIS VALVE REQUIRES DISASSEMBLY PRIOR TO WELDING TO AVOID DAMAGE TO SEATS AND SEALS;

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

744 FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

746 CAST; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

747 VALVE; CHECK; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; SWING TYPE; BONNETLESS; API TRIM # 12 / 12A

748 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; SWING TYPE; COVER: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

768 VALVES ARE TO BE USED IN APPLICATIONS SUBJECT TO CHLORIDE STRESS CRACKING CONSIDERATIONS

771 CAST; STAINLESS STEEL; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM # 10; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

801 BOLT LUBRICANT SHALL BE APPLIED TO ENTIRE LENGTH OF FASTENER THREADS.
PASTE BOLT LUBRICANT; ZIRCONIUM DIOXIDE AND SULPHUR FREE OIL.

803 CAST; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #5 / 5A; DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

804 FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

805 ASME B16.34/16.10 LONG PATTERN; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; FULL PORT TYPE; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER

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Client :BPCL	**Dept./Sect. :** 16/43
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807 ASME B16.34/16.10 LONG PATTERN; CAST; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING:ALLOY 20(UNS N08020)W/FINISHED NUTS; GASKET:CONFINED GRAPHITE/METAL/METAL WITH GRAPHITE; API TRIM #10; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR:HANDWHEEL TO NPS 3, GEAR LARGER SIZES

808 GLOBE; SOCKET WELDING; FORGED; STAINLESS STEEL; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #12/12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

809 FORGED; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

810 CHECK; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; PISTON LIFT CHECK; SPRING LOADED; HORIZONTAL TYPE; COVER: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10; SPRING: STAINLESS STEEL

811 VALVE; CHECK; ASME B16.34; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; SWING TYPE; COVER: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10

812 ASME B16.34/16.10 LONG PATTERN; CAST; STAINLESS STEEL; FULL PORT TYPE; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER

813 VALVE; GATE; API 602; CLASS 800; SOCKET WELD END X NPTF; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #12 / 12A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

814 SOCKET WELD X NPTF; CAST; STAINLESS STEEL; REGULAR PORT TYPE; 3-PIECE BODY; BOLTING: ASTM A193 GR B8; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; SEATING: METAL; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: LEVER; FIRE TESTED TO API 607

903 LICENSOR PMS L7G7 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

955 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE ONLY, IF MENTIONED IN PROCESS DESIGN PACKAGE OR P&ID.

SPECIAL NOTES

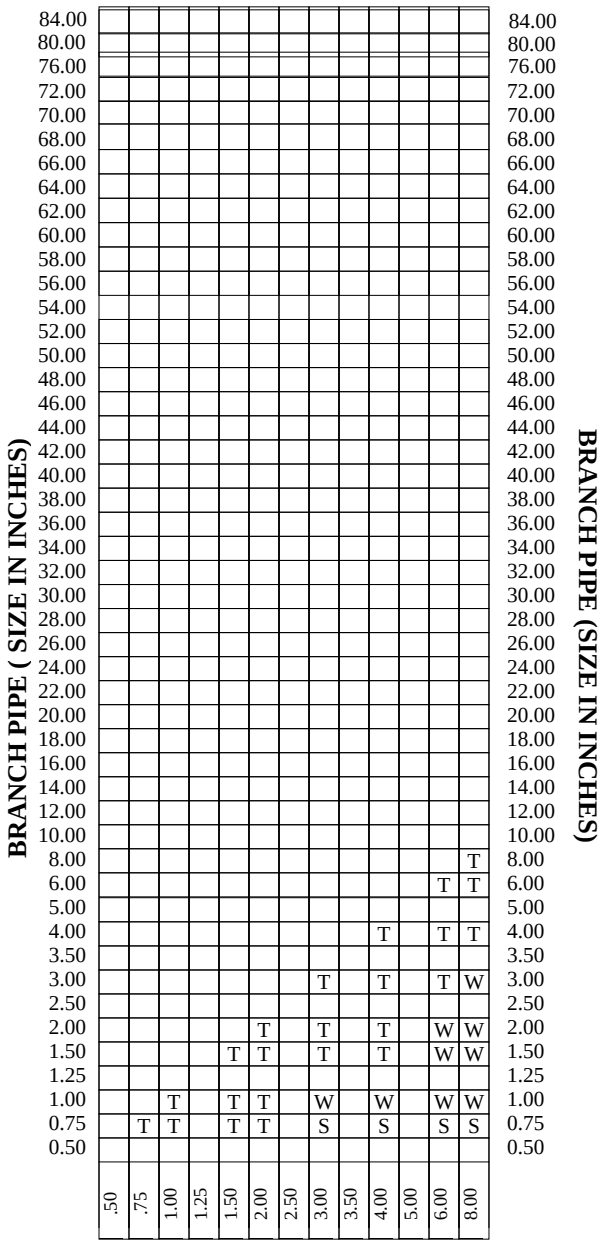
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75"	SW COUPLING	
	1.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-903	
	ON LINES >= 2.0"	NOTE-903	
VENTS	ON LINES <= 1.5"	NOTE-903	
	ON LINES >= 2.0"	NOTE-903	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-903)	
PRESS.CONN	0.75"	NOTE-903	

Package : **IPMCS**

Report No. : **50**

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D21K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	1	1	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	1.5	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	2	4	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	6	8	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
Flange Group									
FLG	FLNG.SW	.75	.75	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FSCF767Z0	
FLG	FLNG.WN	1	8	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FWCF767Z0	
FLB	FLNG.BLIND	.75	8		B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FBCF767Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	600, FF/125AARH	FGKF761Z0	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	1	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	1	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
TEQ	T.EQUAL	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	1	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	1	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
REDC	REDUC.CONC	1	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	
REDE	REDUC.ECC	1	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	

Package : IPMCS
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D21K

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	1	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	307
CPLF	CPLNG.FULL	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	
CPLH	CPLNG.HALF	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	
CPLL	CPLNG.LH	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	
CPLR	CPLNG.RED	.75	.75		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	
O'let Group									
SLT	SOCKOLET	.75	.75		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
WLT	WELDOLET	1	8	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 510ZM	510ZMZZZ0	744,742, 743
GAV	VLV.GATE	2	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515PM	515PMZZZ0	803,742, 743
GAV/3	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510JM	510JMZZZ0	813,728, 742
GAV/2	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 510KM	510KMZZZ0	809,742, 768
GAV/1	VLV.GATE	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515YM	515YMZZZ0	807,742, 768
GLV	VLV.GLOBE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 520PM	520PMZZZ0	804,742, 743
GLV	VLV.GLOBE	2	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525PM	525PMZZZ0	746,742, 743
GLV/2	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, SHT NO.- 525YM	525YMZZZ0	771,742, 768
GLV/1	VLV.GLOBE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 520YM	520YMZZZ0	808,742, 768

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316+STELLITE	SW, 800, 3000, B-16.11, SHT NO.- 530YM	530YMZZZ0	747,742
CHV	VLV.CHECK	2	8		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 535PM	535PMZZZ0	748,742, 743
CHV/2	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, SHT NO.- 535YM	535YMZZZ0	811,742, 768
CHV/1	VLV.CHECK	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 530ZM	530ZMZZZ0	810,742, 768
BLV	VLV.BALL	.75	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545PM	545PMZZZ0	805,720, 742,743
BLV/2	VLV.BALL	.75	1.5		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316	SPCL, 600, 3000, B-16.11, REFER VMS SHT, SHT NO.- 545ZM	545ZMZZZ0	814,720, 721,955, 742
BLV/1	VLV.BALL	.75	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545YM	545YMZZZ0	812,720, 742,768
Bolt Group									
BOS	BOLT.STUD	.75	8		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	801
Gasket Group									
GAS	GASKET	.75	8		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 600	GK69776Z0	731

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PIPE CLASS : **D23F**
RATING : 600
BASE MATERIAL : 5 Cr + 0.5 Mo
CORROSION ALLOWANCE : 4.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	105.45	105.45	103.34	98.42	93.85	90.68	85.06	82.6	79.79	74.86	71.35	68.54	52.37	38.66

538	550	575	600	625	650
28.12	24.58	17.95	12.34	8.16	4.79

SERVICE

MILD TO MODERATE CORROSIVE PROCESSES - FLAMMABLE & NON-LETHAL- CRUDE OIL, RCO, LVGO, HVGO, VB, TAR, VACUUM RESIDUE, TRANSFER LINES, FUEL OIL, DIESEL, HYDROCARBONS, HIGH TEMPERATURE TRANSFER LINES

NOTES

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

85 ALL WELDED FITTINGS SHALL BE NORMALIZED AND TEMPERED.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

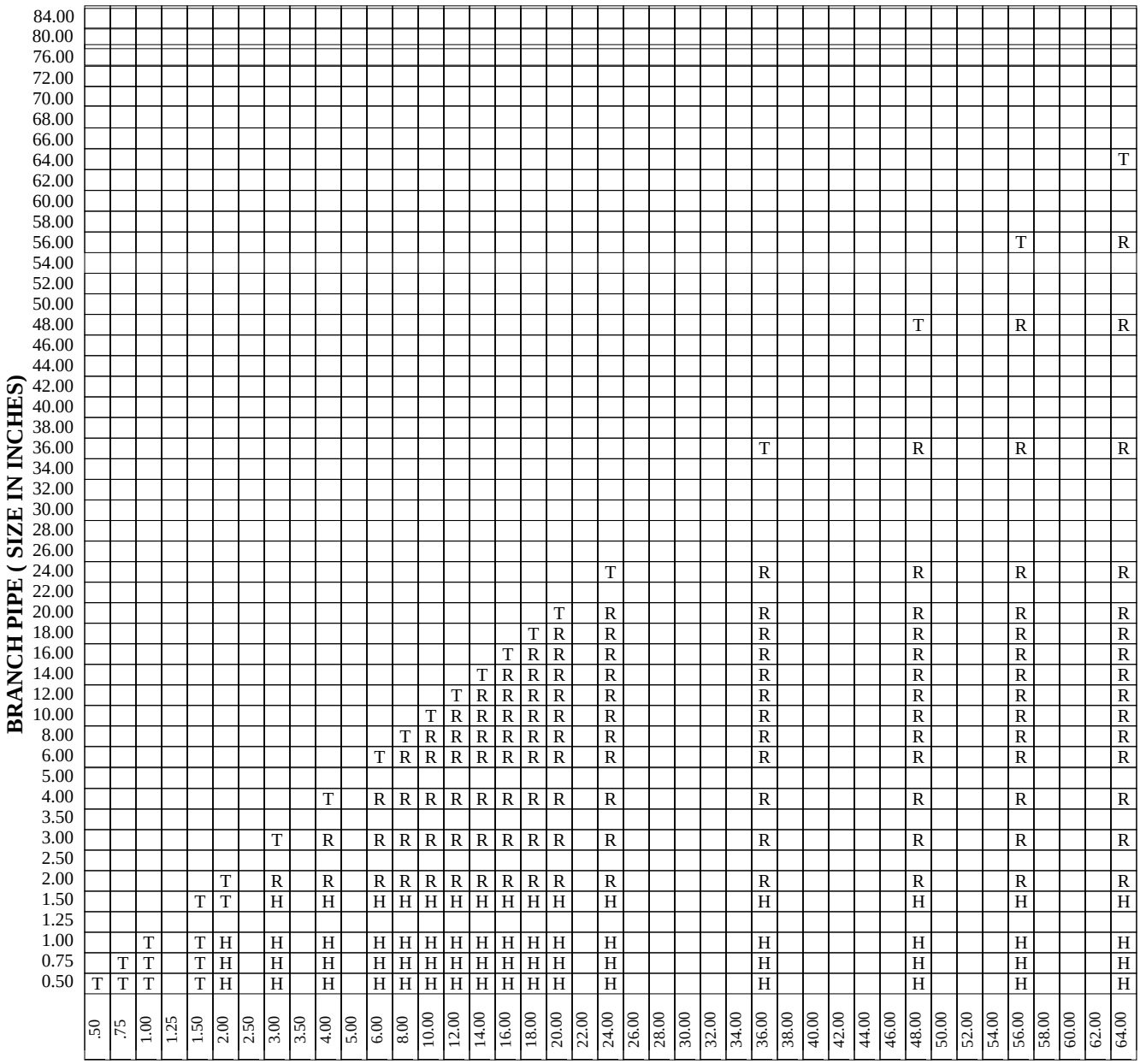
161 PIPE THICKNESS HAS BEEN CALCULATED BASED ON ACTUAL LINE CONDITION [4.2 KG/CM2 @650 DEG.C]

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D23F

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BRANCH PIPE (SIZE IN INCHES)

84.00
80.00
76.00
72.00
70.00
68.00
66.00
64.00
62.00
60.00
58.00
56.00
54.00
52.00
50.00
48.00
46.00
44.00
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
5.00
4.00
3.50
3.00
2.50
2.00
1.50
1.25
1.00
0.75
0.50

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	XXS	B-36.10	ASTM A 335 GR.P5	PE, SEAMLESS	PI25377Z0	
PIP	PIPE	1	1.5	S160	B-36.10	ASTM A 335 GR.P5	PE, SEAMLESS	PI25377Z0	32
PIP	PIPE	2	3	S160	B-36.10	ASTM A 335 GR.P5	BE, SEAMLESS	PI25317Z0	
PIP	PIPE	4	6	S120	B-36.10	ASTM A 335 GR.P5	BE, SEAMLESS	PI25317Z0	
PIP	PIPE	8	8	S100	B-36.10	ASTM A 335 GR.P5	BE, SEAMLESS	PI25317Z0	
PIP	PIPE	10	14	S80	B-36.10	ASTM A 335 GR.P5	BE, SEAMLESS	PI25317Z0	161
PIP	PIPE	16	24	S100	B-36.10	ASTM A 691 GR5CR CL.42	BE, E.FS.W	PI2C613Z0	161
PIP	PIPE	36	36	51.0	B-36.10	ASTM A 691 GR5CR CL.42	BE, E.FS.W	PI2C613Z0	161
PIP	PIPE	48	48	67.0	B-36.10	ASTM A 691 GR5CR CL.42	BE, E.FS.W	PI2C613Z0	161
PIP	PIPE	56	56	76.2	B-36.10	ASTM A 691 GR5CR CL.42	BE, E.FS.W	PI2C613Z0	32,161
PIP	PIPE	64	64	86.5	B-36.10	ASTM A 691 GR5CR CL.42	BE, E.FS.W	PI2C613Z0	32,161
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 335 GR.P5	PBE, SEAMLESS	PN25367Z0	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 335 GR.P5	PBE, SEAMLESS	PN25367Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F5	600, RF/125AARH	FSC5167Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F5	600, RF/125AARH	FWC5167Z0	
FLG	FLNG.WN	26	60	M	B-16.47-B	ASTM A 182 GR.F5	600, RF/125AARH	FWB5167Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F5	600, RF/125AARH	FBC5167Z0	
FLB	FLNG.BLIND	26	60		B-16.47-B	ASTM A 182 GR.F5	600, RF/125AARH	FBB5167Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F5	600, FF/125AARH	FGK5161Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F5	600, FF/125AARH	FCK5161Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WA652D3Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW, 1.5D	WAGT94Z10	

Package : IPMCS
Report No. : 50

D23F

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23F** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB90	ELBOW.90	16	64	M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW, 1.5D	WAGU14Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WB652D3Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW, 1.5D	WBGT94Z10	
ELB45	ELBOW.45	16	64	M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW, 1.5D	WBGU14Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WE652D3Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW	WEGT94ZZ0	
TEQ	T.EQUAL	16	64	M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW	WEGU14ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WR652D3Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW	WRGT94ZZ0	
TRED	T.RED	16	64	M, M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW	WRGU14ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW	WUGT94ZZ0	
REDC	REDUC.CONC	16	64	M, M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW	WUGU14ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW	WVGT94ZZ0	
REDE	REDUC.ECC	16	64	M, M	B-16.9	ASTM A 234 GR.WP5-W CL.1	BW	WVGU14ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F5	PBE	WNH526ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F5	PBE	WPH526ZZ0	
CAP	CAP	2	64	M	B-16.9	ASTM A 234 GR.WP5 CL. 1	BW	WFGT94ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WJ652D3Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WK652D3Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WL652D3Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F5	SW, 6000	WM652D3Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F5,TRIM-STELLITED,STEM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 510BF	510BFZZZ0	

Package : IPMCS
Report No. : 50

D23F

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23F** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 217 GR.C5 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515BF	515BFZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F5,TRIM-STELLITED,STEM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 520BF	520BFZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 217 GR.C5 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525BF	525BFZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F5,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530BF	530BFZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 217 GR.C5 (NORM. & TEMP.),TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53536	53536ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	60		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	60		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23M** Sheet 1 of 5

PIPE CLASS : **D23M**
RATING : 600
BASE MATERIAL : SS321
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	101.23	101.23	91.04	83.66	77.68	72.41	68.54	66.78	65.38	64.32	63.27	62.91	62.21	54.48
	538													
	50.96													

SERVICE

CORROSIVE LIQUID, VAPOUR AND GAS - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL, HYDROGENATION,
PYROLYSIS GAS, SECOND STAGE REACTOR

NOTES

49 ITEMS SHALL BE SUPPLIED IN A STABILISED HEAT TREATED CONDITION. STABILISING HEAT TREATMENT SHALL BE CARRIED OUT SUBSEQUENT TO THE NORMAL SOLUTION ANNEALING. SOAKING TEMPERATURE AND HOLDING TIME FOR STABILISING HEAT TREATMENT SHALL BE 900 DEG C AND 4 HOURS RESPECTIVELY.

74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.

125 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [270 DEG. C & 50.40 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

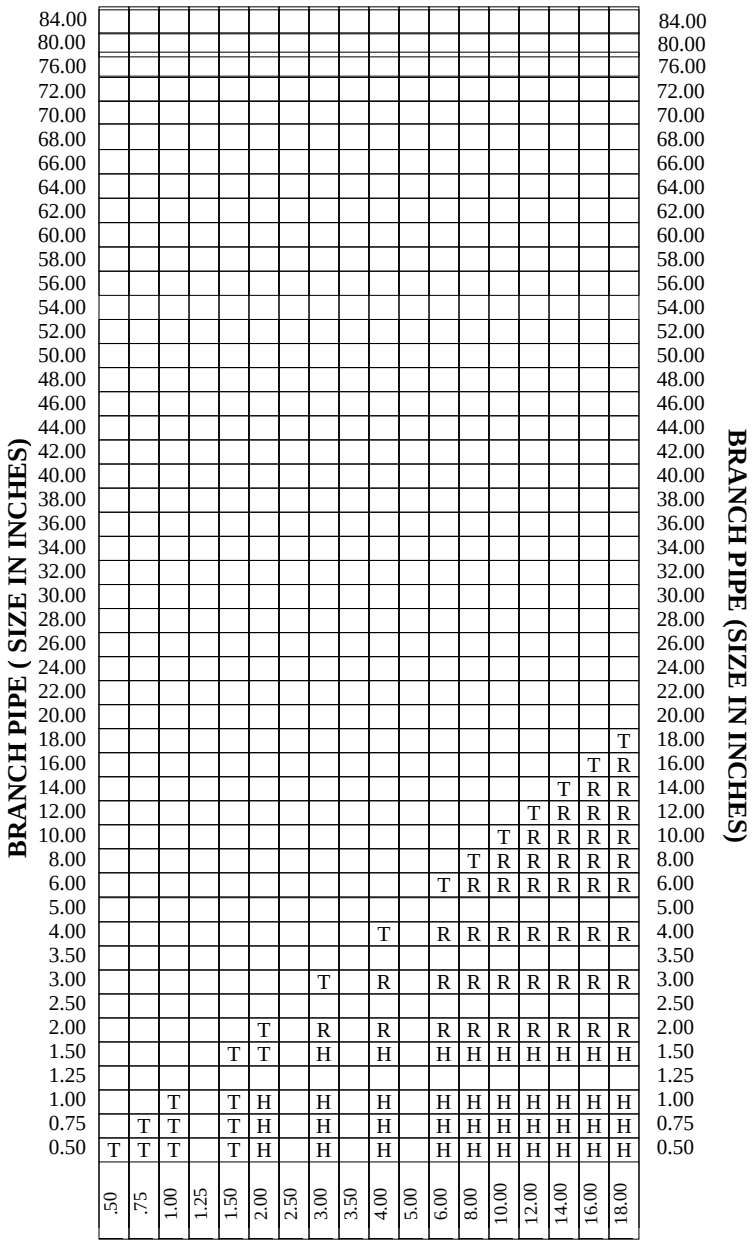
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23M** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D23M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23M** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP321	PE, SEAMLESS	PI34177Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP321	PE, SEAMLESS	PI34177Z0	
PIP	PIPE	2	4	40S	B-36.19	ASTM A 312 TP321	BE, SEAMLESS	PI34117Z0	
PIP	PIPE	6	6	80S	B-36.19	ASTM A 312 TP321	BE, SEAMLESS	PI34117Z0	
PIP	PIPE	8	8	CALC	B-36.19	ASTM A 312 TP321	BE, SEAMLESS	PI34117Z0	
PIP	PIPE	10	10	40S	B-36.19	ASTM A 358 TP321 CL.1	BE, E.FS.W	PI37113Z0	125
PIP	PIPE	12	14	80S	B-36.19	ASTM A 358 TP321 CL.1	BE, E.FS.W	PI37113Z0	125
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP321	PBE, SEAMLESS	PN34167Z0	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP321	PBE, SEAMLESS	PN34167Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F321	600, RF/125AARH	FSC4767Z0	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 182 GR.F321	600, RF/125AARH	FWC4767Z0	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 182 GR.F321	600, RF/125AARH	FBC4767Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F321	600, FF/125AARH	FGK4761Z0	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 182 GR.F321	600, FF/125AARH	FCK4761Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WA648D2Z0	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP321-S	BW, 1.5D	WAGA54Z10	
ELB90	ELBOW.90	10	14	M	B-16.9	ASTM A 403 GR.WP321-WX	BW, 1.5D	WAGA74Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WB648D2Z0	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP321-S	BW, 1.5D	WBGA54Z10	
ELB45	ELBOW.45	10	14	M	B-16.9	ASTM A 403 GR.WP321-WX	BW, 1.5D	WBGA74Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WE648D2Z0	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP321-S	BW	WEGA54ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23M** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	10	14	M	B-16.9	ASTM A 403 GR.WP321-WX	BW	WEGA74ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WR648D2Z0	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP321-S	BW	WRGA54ZZ0	
TRED	T.RED	10	14	M, M	B-16.9	ASTM A 403 GR.WP321-WX	BW	WRGA74ZZ0	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP321-S	BW	WUGA54ZZ0	
REDC	REDUC.CONC	10	14	M, M	B-16.9	ASTM A 403 GR.WP321-WX	BW	WUGA74ZZ0	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP321-S	BW	WVGA54ZZ0	
REDE	REDUC.ECC	10	14	M, M	B-16.9	ASTM A 403 GR.WP321-WX	BW	WVGA74ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F321	PBE	WNH486ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F321	PBE	WPH486ZZ0	
CAP	CAP	2	14	M	B-16.9	ASTM A 403 GR.WP321-S	BW	WFGA54ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WJ648D2Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WK648D2Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WL648D2Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F321	SW, 3000	WM648D2Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F321,TRIM-STELLITED,STEM-SS 347	SW, 800, 3000, B-16.11, SHT NO.-510BN	510BNZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8C,TRIM-STELLITED,STEM-SS 347	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 515BN	515BNZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F321,TRIM-STELLITED,STEM-SS 347	SW, 800, 3000, B-16.11, SHT NO.-520BN	520BNZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF8C,TRIM-STELLITED,STEM-SS 347	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525BN	525BNZZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D23M** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F321,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.-530BN	530BNZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8C,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 535BN	535BNZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A453 GR.660CL.A, NUT:A453 GR.660CL.A		BS43014Z0	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS321+GRAFIL+I RING	SPIRAL, 600	GK66776Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D28A** Sheet 1 of 6

PIPE CLASS : **D28A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	93	149	204	260	316	343	371
PRESS	104	94.9	92.1	88.9	84.4	77	75.6	74.5

SERVICE

CYCLE GAS; CYCLIC SERVICE; NITROGEN; (BASED ON LICENSOR PMS CLASS - LPZ04)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

732 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS
ENGINEER PER ASME B31.3 PARAGRAPH 301.5.4. (CONT.)

733 (CONT. FROM NOTE NO. 732) IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

737 GROOVED METAL SS316L(UNS S31603); FLEXIBLE GRAPHITE; GROOVED FLAT PROFILE METALLIC CORE(4 MM) WITH SOFT GASKET SEALING MATERIAL ON EITHER FACE(0.50 MM EACH). LOOSE LOCATING RING, SS316L(UNS S31603); TO BE USED IF SPECIFIED IN PROCESS DESIGN PACKAGE/ P&ID: DON'T APPLY LUBRICANT OR ANTI-SEIZE COMPOUND

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

754 FIRE WATER SPRAY PROTECTION SHALL BE PROVIDED FOR IN-LINE NON-FIRE TESTED VALVES

755 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM;BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

760 IN ORDER TO ELIMINATE THE OCCURRENCE OF POTENTIAL STRESS RISERS DETRIMENTAL TO PIPING IN CYCLIC SERVICES, EXTRA CARE MUST BE TAKEN DURING FABRICATION. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO WELDING. WHEREVER POSSIBLE, THE INSIDE SURFACE OF BUTT WELDS SHALL BE GROUND FLUSH.

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
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761 ALL INTERNAL WELD SPLATTER AND BURRS SHALL BE REMOVED. THE GTAW WELD PROCESS SHALL BE USED FOR THE ROOT PASS OF ALL BUTT WELDS TO PROMOTE A SMOOTH INNER BORE; ROOT PENETRATION SHALL BE KEPT TO A MINIMUM.

762 ALL HOLES FOR (SET-ON STYLE) "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING, OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE; A STRAIGHT BORE OLET IS REQUIRED FOR THESE APPLICATIONS.

775 FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

776 FLANGED; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; OS&Y; BONNET: BOLTED; RISING STEM; BOLTING: ASTM A 193 GR B7; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #8 / 8A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES;

786 8-THREAD SERIES BOLTS ARE REQUIRED WHEN THE FLANGE BOLT DIAMETER IS 1 1/8 INCH OR LARGER PER ASTM A 193; THE PREFERRED INSTALLATION IS WITH THE STEM IN THE HORIZONTAL POSITION.

787 (CONT. FROM NOTE NO. 786) VALVE SHALL BE BI-DIRECTIONAL AND CAPABLE OF DEAD END SERVICE AT FULL-RATED PRESSURE. PRIOR TO INSTALLATION ASSURE THAT FLANGE GASKET FACE INCLUDING THE RETAINER RING AND BOLTING ARE SUITABLE TO PROVIDE SEALING WITH THE SELECTED GASKET.

791 VALVE; GATE; API 602; CLASS 800; BUTT WELDING X NPTF; FORGED; CARBON STEEL; ASTM A 105; OS&Y; RISING STEM; BONNET: WELDED; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL;

800 REQUISITIONER MUST SPECIFY CRACKING PRESSURE FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG;

806 PIPING SUPPORT LOCATION MUST BE DETERMINED IN CONCERT WITH THE ANALOG TECHNOLOGIST TO AVOID HARMONICS DUE TO VIBRATION AND THE STRESS ANALYST TO AVOID EXCESSIVE THERMAL STRESSES / STRAINS. 'HOLD DOWN' TYPE SUPPORTS WILL TYPICALLY BE REQUIRED.

815 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.
FOR SIZE RANGE 3/4" TO 1" : STR-366 IS TO BE FOLLOWED

824 ASME B16.34/16.10 LONG PATTERN; CAST; CARBON STEEL;BOLTING: ASTM A 193 GR B7; HARDENED STAINLESS STEEL STEM; SEATING: GRAPHITE; 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; OPERATOR: LEVER; VALVES NPS 1 1/2 AND SMALLER WILL BE BI-DIRECTIONAL, NPS 2 AND LARGER WILL BE UNI-DIRECTIONAL.

825 ASME B16.34/16.10 LONG PATTERN; CAST; CARBON STEEL; TRUNNION MOUNTED; BOLTING: ASTM A 193 GR B7; HARDENED STAINLESS STEEL STEM; SEATING: METAL; NICKEL ALLOY OVERLAY 316 STAINLESS STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: WEATHERPROOF GEAR;

826 DOUBLE FLGD; CAST; BOLTING: ASTM A 193 GR B7; GASKET: GRAPHITE OR METAL OR METAL WITH GRAPHITE; SS STEM; SEATING: METAL; SEATING RING: METAL OR METAL/GRAPHITE; CARBON STEEL DISC; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); OPERATOR: WEATHERPROOF GEAR; ASME B16.5/B16.47 SERIES A;

931 LICENSOR PMS LPZ04 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

933 VALVE; CHECK; RAISED FACE; TAPPED LUG OR DOUBLE FLG; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; DUAL-PLATE WAFER-LUG STYLE; API TRIM #8 / 8A; CARBON STEEL DISC; SPRING: INCONEL; ASME B16.5 / B16.47 SERIES A.

938 X-STRONG; CAST; CARBON STEEL; ASTM A 216 GRADE WCB; WAFER INSERT TYPE; API TRIM #1; SPRING: INCONEL-X; CLASS 600 CHECK-ALL VALVES MAY BE BOLTED BETWEEN CLASS 150, CLASS 300 OR CLASS 600 FLANGES; TO BE USED WITH X-STRONG OR THINNER WALL PIPE.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

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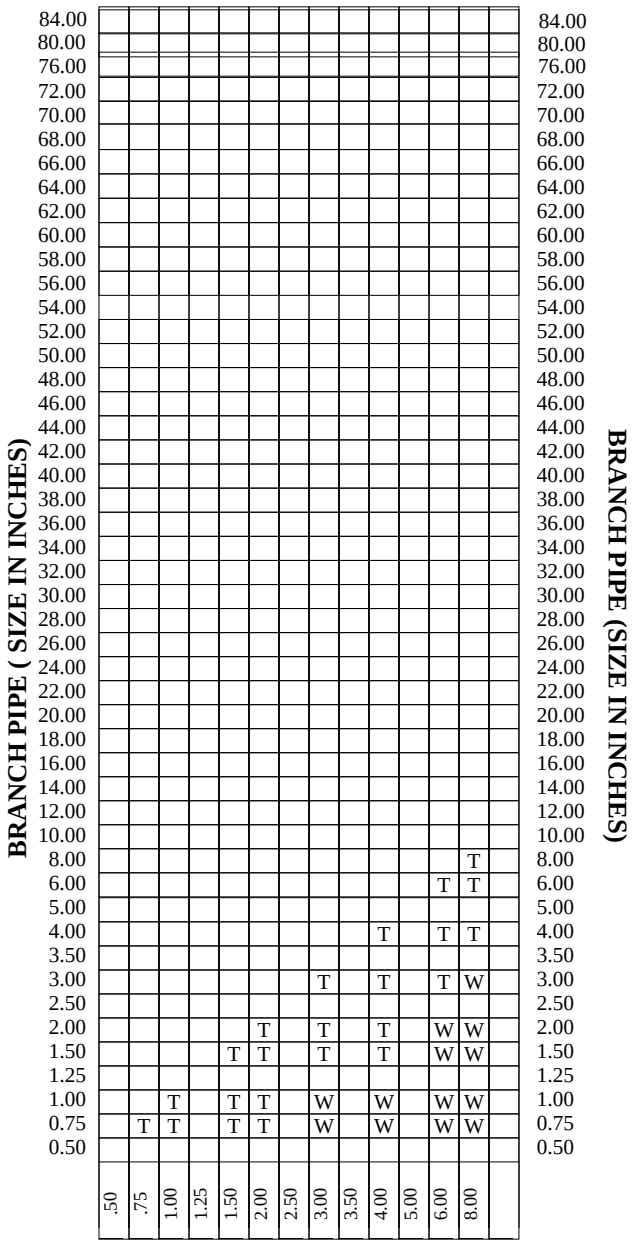
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SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-931	
	ON LINES >= 2.0"	NOTE-931	
VENTS	ON LINES <= 1.5"	NOTE-931	
	ON LINES >= 2.0"	NOTE-931	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-931)	
PRESS.CONN	0.75"	NOTE-931	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D28A

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Location BINA, MADHYA PRADESH	**Pipe Class :D28A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	2	8	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.WN	.5	8	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z0	
FLB	FLNG.BLIND	.5	8		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z0	
Fitting Group									
ELB90	ELBOW.90	.75	8	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.75	8	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.75	8	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.75	8	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
REDC	REDUC.CONC	.75	8	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDE	REDUC.ECC	.75	8	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
CAP	CAP	.75	8	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
O'let Group									
WLT	WELDOLET	.75	6	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515VB	515VBZZZ0	755,725, 742,754
GAV	VLV.GATE	2	8		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515QC	515QCZZZ0	776,726, 742,754
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510QC	510QCZZZ0	791,725, 728
GLV	VLV.GLOBE	.75	1.5		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR	FLGD, 600, B-16.5, RF/125AARH, SHT	525VBZZZ0	775,742, 754

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Location BINA, MADHYA PRADESH	**Pipe Class :D28A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STEEL+STELLITED	NO.- 525VB		
GLV	VLV.GLOBE	2	8		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525QC	525QCZZZ0	776,742, 754
CHV	VLV.CHECK	1.5	4		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535QC	535QCZZZ0	938,705, 800,742, 754
CHV	VLV.CHECK	6	8		API-594	BODY-ASTM A 216 GR.WCB,TRIM-13%CR STEEL+STELLITED	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535VD	535VDZZZ0	933,705, 742,754
BLV	VLV.BALL	.75	4		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545QC	545QCZZZ0	824,726, 720,742, 754
BLV	VLV.BALL	6	6		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545QC	545QCZZZ0	825,726, 742,754
BFV	VLV.BTRFLY	3	8		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,STEM-STAINLESS STEEL, DISC-CARBON STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 565QC	565QCZZZ0	826,742, 754
Bolt Group									
BOS	BOLT.STUD	.5	8		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	8		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 600	GK66376Z0	731
GAS/600	GASKET	.5	8		B-16.20-ANSI B16.5	SS 316L	RING, 600, 5 MM	GK67556Z0	737

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PIPE CLASS : **D2A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	0	38	93	149	204	260	316	343	371	399	427
PRESS	104.05	104.05	104.05	95.6	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58

SERVICE

STEAM (IBR), STEAM CONDENSATE(IBR), BOILER FEED WATER (IBR), HP STEAM(IBR), HP CONDENSATE (IBR).

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

9 CARBON CONTENT SHALL NOT EXCEED 0.25% FOR ALL PIPES,FITTINGS FLANGES ETC. THAT MAY REQUIRE WELDING. MOREOVER,FOR FLANGES THE SULPHUR AND PHOSPHOROUS SHALL ALSO BE LIMITED TO 0.05% EACH.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

117 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [420 DEG. C & 46.0 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

118 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [420 DEG. C & 46.0 KG/ CM2 G] SUBJECT TO MINIMUM 20 MM THICKNESS.

119 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [420 DEG. C & 46.0 KG/ CM2 G].

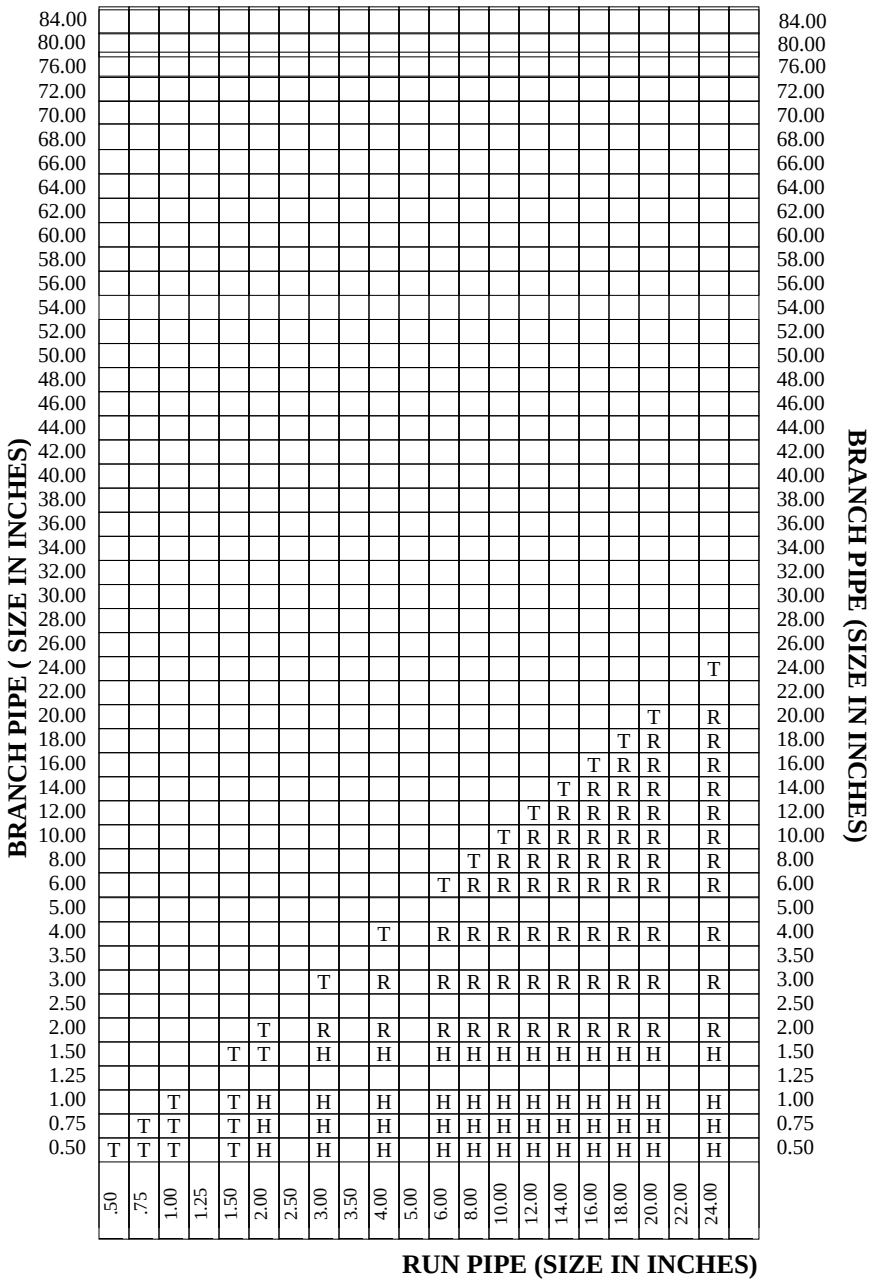
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z1	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	4	8	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	
PIP	PIPE	10	12	S80	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	26
PIP	PIPE	14	14	S60	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	117
PIP	PIPE	16	16	16.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	3,117
PIP	PIPE	18	18	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	3,117
PIP	PIPE	20	20	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	3,118
PIP	PIPE	24	24	S60	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z1	119
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z1	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z1	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z1	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	600, FF/125AARH	FCK0161Z1	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z1	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z1	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z11	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z11	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z1	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z1	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z11	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z11	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z1	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z1	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ1	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ1	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z1	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z1	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ1	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ1	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ1	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ1	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ1	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ1	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ1	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z1	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z1	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z1	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z1	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z1	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z1	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z1	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51002	51002ZZZ1	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51502	51502ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52002	52002ZZZ1	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52502	52502ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53002	53002ZZZ1	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53502	53502ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDNMC, 600,RF/125AARH	TR30655E1	
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70;INT:SS304	CONETYPE, 600,FF/125AARH	ST1683IZ1	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D511	
PSR	STRNR.PERM	2	24		MNF'STD	B:A216GR.WCB;INT:SS304	FLGD, Y-TYPE, 600,RF/125AARH	SP38055E1	

Package : IPMCS
Report No. : 50

D2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D2D** Sheet 1 of 5

PIPE CLASS : **D2D**
RATING : 600
BASE MATERIAL : 1.25 Cr + 0.5Mo
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	105.46	105.46	105.46	101.59	97.37	93.5	85.07	82.61	79.79	74.87	71.36	68.55	63.27	44.99
	538													
	30.23													

SERVICE

STEAM (IBR) ABOVE 454 DEG C

NOTES

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

13 USE NORMALIZED AND TEMPERED MATERIAL ONLY.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

42 ALL WELDS SHALL BE STRESS RELIEVED.

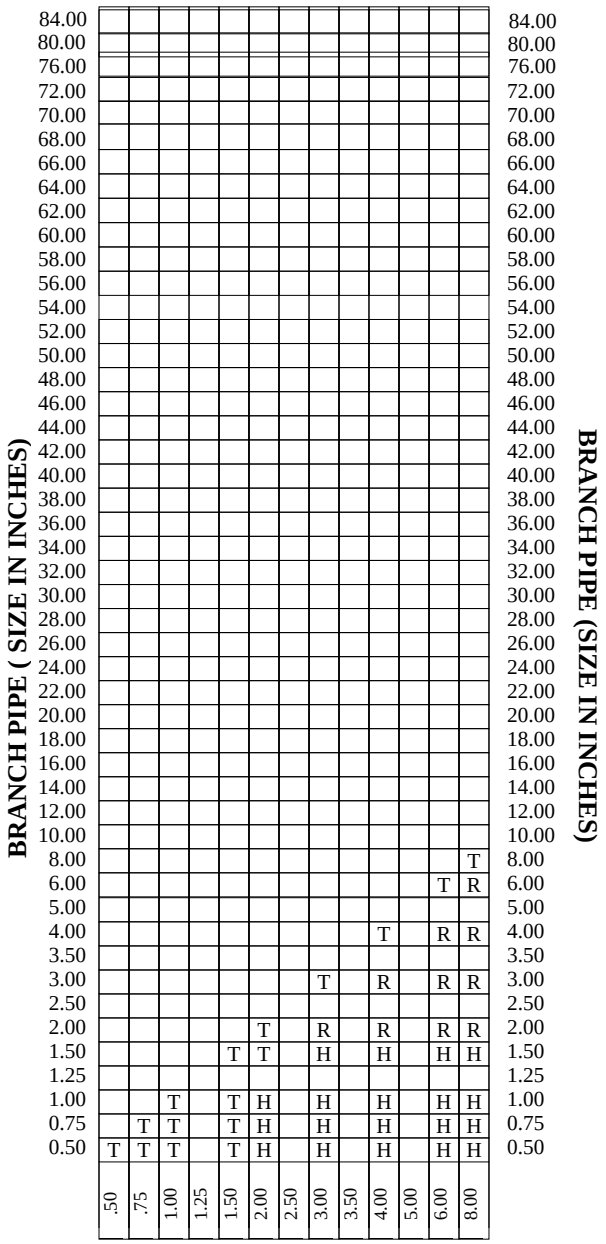
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D2D** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D2D

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D2D** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z1	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 335 GR.P11	PE, SEAMLESS	PI24977Z1	
PIP	PIPE	2	8	XS	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	
PIP	PIPE	10	14	CALC	B-36.10	ASTM A 335 GR.P11	BE, SEAMLESS	PI24917Z1	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 691 GR.1.25CR CL.42	BE, E.FS.W	PI2B913Z1	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z1	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 335 GR.P11	PBE, SEAMLESS	PN24967Z1	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F11 CL.2	600, RF/125AARH	FSC3767Z1	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F11 CL.2	600, RF/125AARH	FWC3767Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F11 CL.2	600, RF/125AARH	FBC3767Z1	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F11 CL.2	600, FF/125AARH	FGK3761Z1	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F11 CL.2	600, FF/125AARH	FCK3761Z1	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WA638D3Z1	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WA638D2Z1	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WAG564Z11	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WAG584Z11	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WB638D3Z1	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WB638D2Z1	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW, 1.5D	WBG564Z11	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW, 1.5D	WBG584Z11	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WE638D3Z1	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WE638D2Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D2D** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WEG564ZZ1	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WEG584ZZ1	
TRED	T.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WR638D3Z1	
TRED	T.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WR638D2Z1	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WRG564ZZ1	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WRG584ZZ1	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WUG564ZZ1	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WUG584ZZ1	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WVG564ZZ1	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WP11-W CL.1	BW	WVG584ZZ1	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WNH386ZZ1	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F11 CL.2	PBE	WPH386ZZ1	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WP11 CL.1	BW	WFG564ZZ1	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WJ638D3Z1	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WJ638D2Z1	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WK638D3Z1	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WK638D2Z1	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WL638D3Z1	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WL638D2Z1	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 6000	WM638D3Z1	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 182 GR.F11 CL.2	SW, 3000	WM638D2Z1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. &	SW, 800, 3000, B-16.11, SHT NO.- 51031	51031ZZZ1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D2D** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						TEMP.),TRIM-STELLITED,STEM-13%CR STEEL			
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51531	51531ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52031	52031ZZZ1	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED,STEM-13% CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52531	52531ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F11 CL.2 (NORM. & TEMP.),TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53031	53031ZZZ1	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 217 GR.WC6 (NORM. & TEMP.),TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53531	53531ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A182GR.F11C2;T:13%CR;S:SS304	FLGD, THRMDNMC, 600,RF/125AARH	TR31155E1	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A182GR.F11CL.2;INT:SS304	SW, Y-TYPE, 800	SP310D511	
PSR	STRNR.PERM	2	24		MNF'STD	B:A217GR.WC6;INT:SS304	FLGD, Y-TYPE, 600,RF/125AARH	SP38255E1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D34K** Sheet 1 of 3

PIPE CLASS : **D34K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149
PRESS	66.4	66.4	66.4	52.7

SERVICE

PROCESS TUBING - RO, CATALYST BLOW BACK (BASED ON LICENSOR PMS CLASS - LGP55)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

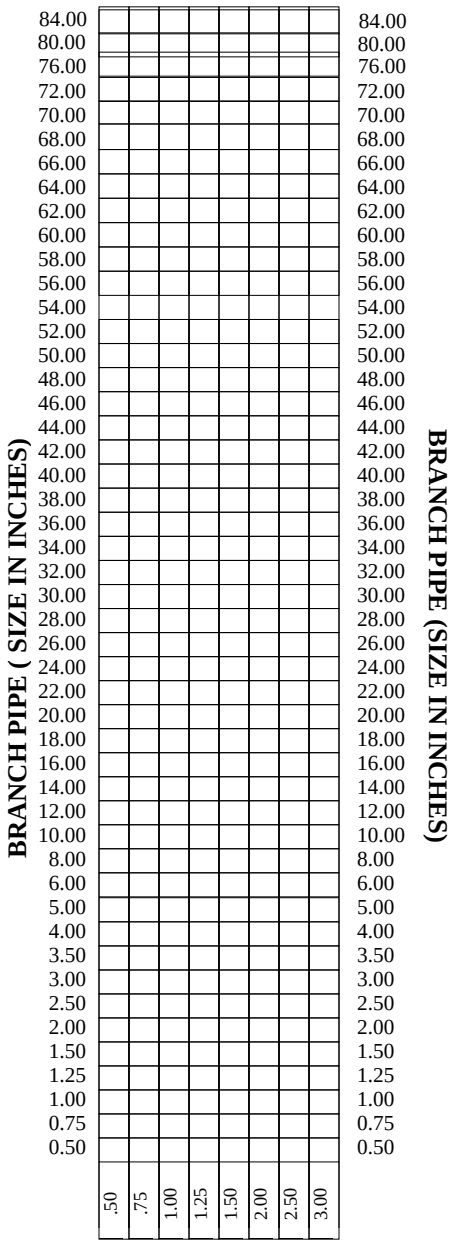
952 FOR THIS SPEC, REFER LICENSOR CLASS LGP55

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D34K** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D34K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D34K** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 1 of 6

PIPE CLASS : **D36A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	190
PRESS	104.05	104.05	94.91	89.28	89.28

SERVICE

HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE & NON-LETHAL, KILL GAS (BASED ON LICENSOR PMS CLASS - 1G4/1G4A)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

123 PIPING WITH THICKNESS>12.7 SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

201 100% RADIOGRAPHY TO BE DONE FOR ALL BUTT WELDS.

202 ALL REQUIREMENTS OF ASME B31.12 SHALL BE MET.

203 BODY/BONNET/COVER JOINTS & STUFFING BOX OF ALL VALVES SHALL HAVE LOW EMISSION. ONE VALVE PER METALLURGY, PER RATING, PER SIZE SHALL BE HELIUM LEAK TESTED AS PER ASME SEC.V, SUBSECTION A,ARTICLE 10(DETECTOR PROBE TECHNIQUE), APPENDIX IV AT A MIN OF 25% OF THE ALLOWABLE (RATED) COLD WORKING PRESSURE.

311 USE FOR ONLY THERMOWELL CONNECTION.

597 FOR LINES WITH DESIGN TEMPERATURE EXCEEDING 230 DEG. C., PARTIAL PRESSURE OF H2 SHALL NOT EXCEED API RP 941 LIMITS.

598 ALL WELDS IN LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C SHALL BE STRESS RELIEVED.

619 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1G4/1G4A

647 USE PTFE COATED STUD BOLTS AND NUTS FOR 1G4A.

648 UNION TYPE COUPLING WITH BUNA-N O-RING SEAL: CPV "O-SEAL" OR EQUIVALENT, TO BE USED FOR FULL COUPLING AND REDUCING COUPLING

649 UNION TYPE COUPLING IS PREFERRED, BUT FLANGES MAY BE USED TO MATCH EQUIPMENT NOZZLE.

650 USE CPV GLOBE VALVE FOR VENT AND DRAINS WITH A CPV "O-SEAL" CAP.

651 USE CPV NEEDLE VALVE FOR INSTRUMENT CONNECTION.

652 USE COUPLING & VALVE FROM " COMBINATION PUMP VALVE COMPANY" (CPV) MANUFACTURER

661 USE VITON-A O-RINGS WHERE HIGHER TEMPERTATURE RATING IS REQUIRED (ABOVE 107 DEG C) BUT DO NOT USE AT LOWER TEMPERATURES THAN -15 DEG C.

664 PTFE FILLER; FLEXITALLIC STYLE CG OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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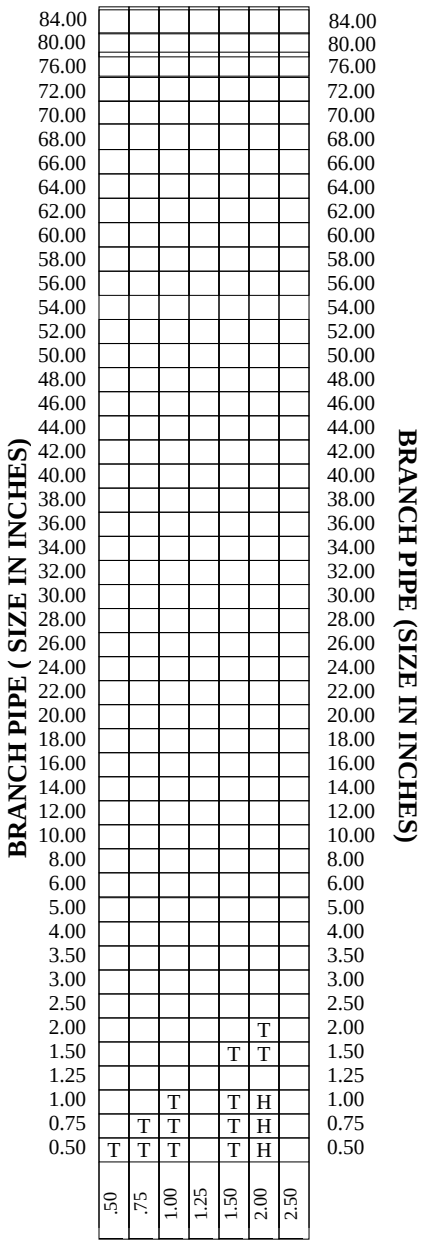
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	2.0" & BELOW	CPV O-SEAL SYSTEM, FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	2.0" & BELOW	SOCKET OR BUTT-WELDED WITH SPECIAL O-RING UNIONS. BACKING RINGS SHALL NOT BE USED FOR WELDED JOINTS.	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH CPV VALVE AND FITTINGS.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH CPV VALVE AND FITTINGS.	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH CPV VALVE AND FITTINGS.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH CPV VALVE AND FITTINGS.	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH CPV VALVES AND FITTINGS,	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D36A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z7	
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z7	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z7	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z7	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	
REDC	REDUC.CONC	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ7	
REDE	REDUC.ECC	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ7	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	.5	.75		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z7	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z7	
CPLF	CPLNG.FULL	.5	2		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	648
CPLH	CPLNG.HALF	.5	2		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	648
CPLL	CPLNG.LH	.5	2		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	648
CPLR	CPLNG.RED	.5	2		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	648
UNN	UNION	.5	2		MNF'STD	ASTM A 105	SW, 6000	WQN02D3Z7	648,661
O'let Group									
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YES02D2Z7	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 3000	YLS02D2Z7	311
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51004	51004ZZZ7	619
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51504	51504ZZZ7	619
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52004	52004ZZZ7	619
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52504	52504ZZZ7	619
CHV	VLV.CHECK	.5	1.5		BS EN ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53004	53004ZZZ7	619
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53504	53504ZZZ7	619

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z7	647
Gasket Group									
GAS	GASKET	.5	2		API-601	SP.WND SS316+PTFE+ I RING	SPIRAL, 600	GK1DY76Z7	664

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36K** Sheet 1 of 5

PIPE CLASS : **D36K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-101	-29	93	149	204	260	316	343	371	399
PRESS	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38

SERVICE

HYDROGEN (BASED ON LICENSOR PMS CLASS - 6G57)

NOTES

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

202 ALL REQUIREMENTS OF ASME B31.12 SHALL BE MET.

203 BODY/BONNET/COVER JOINTS & STUFFING BOX OF ALL VALVES SHALL HAVE LOW EMISSION. ONE VALVE PER METALLURGY, PER RATING, PER SIZE SHALL BE HELIUM LEAK TESTED AS PER ASME SEC.V, SUBSECTION A,ARTICLE 10(DETECTOR PROBE TECHNIQUE), APPENDIX IV AT A MIN OF 25% OF THE ALLOWABLE (RATED) COLD WORKING PRESSURE.

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

341 PIPING SHALL PASS A SENSITIVE LEAK TEST IN ACCORDANCE WITH PPM-570 PRIOR TO INITIAL OPERATION.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

633 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 6G57

668 GRAFOIL GTB FILLER; LAMONS STYLE WRI OR EQUAL.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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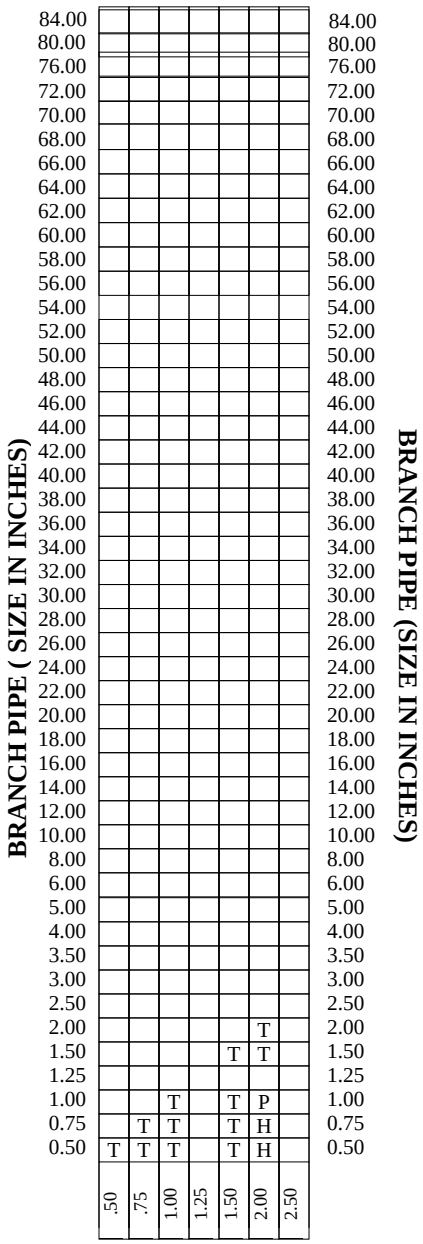
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36K** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINANCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	0.75" & BELOW	SW COUPLING	
	1" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER STD 7-44-0350, DP3	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER STD. 7-44-0351, D3	
VENTS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE; REFER STD. 7-44-0350, VP3	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH SW X SCRD GATE VALVE. REFER STD 7-44-0351, V3	
TEMP. CONN.		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS. CONN.	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36K** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D36K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z7	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z7	
PIP	PIPE	2	2	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z7	
Flange Group									
FLG	FLNG.SW	.75	.75	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FSCD867Z7	
FLG	FLNG.WN	1	2	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FWCD867Z7	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FBCD867Z7	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 182 GR.F304/304L	600, FF/125AARH	FGKD861Z7	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z7	
ELB90	ELBOW.90	1	2	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z17	
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z7	
ELB45	ELBOW.45	1	2	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z17	
TEQ	T.EQUAL	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z7	
TEQ	T.EQUAL	1	2	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ7	
TRED	T.RED	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z7	
TRED	T.RED	1	2	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ7	
REDC	REDUC.CONC	1	2	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ7	
REDE	REDUC.ECC	1	2	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ7	
SWGC	SWAGE.CONC	.75	2	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ7	
SWGE	SWAGE.ECC	.75	2	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ7	
CAP	CAP	1	2	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ7	422
PLG	PLUG	.75	.75		B-16.11	ASTM A 182 GR.F304	SCRM, 3000	WH64292Z7	307
CPLF	CPLNG.FULL	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z7	

Package : IPMCS
Report No. : 50

D36K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D36K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLH	CPLNG.HALF	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z7	
CPLL	CPLNG.LH	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z7	
CPLR	CPLNG.RED	.75	.75		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z7	
O'let Group									
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YES424ZZ7	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YLS424ZZ7	311
Valves Group									
GAV	VLV.GATE	.75	2		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510TP	510TPZZZ7	633
GAV/1	VLV.GATE	.75	.75		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 510TQ	510TQZZZ7	312,633
GLV	VLV.GLOBE	.75	2		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520TP	520TPZZZ7	633
CHV	VLV.CHECK	.75	2		MNF'STD	BODY-ASTM A 182 GR.F316L,METAL	SW, 6000, 6000, MNF'STD, SHT NO.- 532TP	532TPZZZ7	633
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B8CL.2, NUT:A194 GR.8M		BS43612Z7	
Gasket Group									
GAS	GASKET	.5	2		API-601	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 600	GK16476Z7	668

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 1 of 6

PIPE CLASS : **D40A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE

NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE REFRIGERANT, XYLENE, METHANOL, ETHYLENE REFRIGERANT, NH3, GAS FLARE, ETC.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

120 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.50 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

121 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.50 KG/ CM2 G].

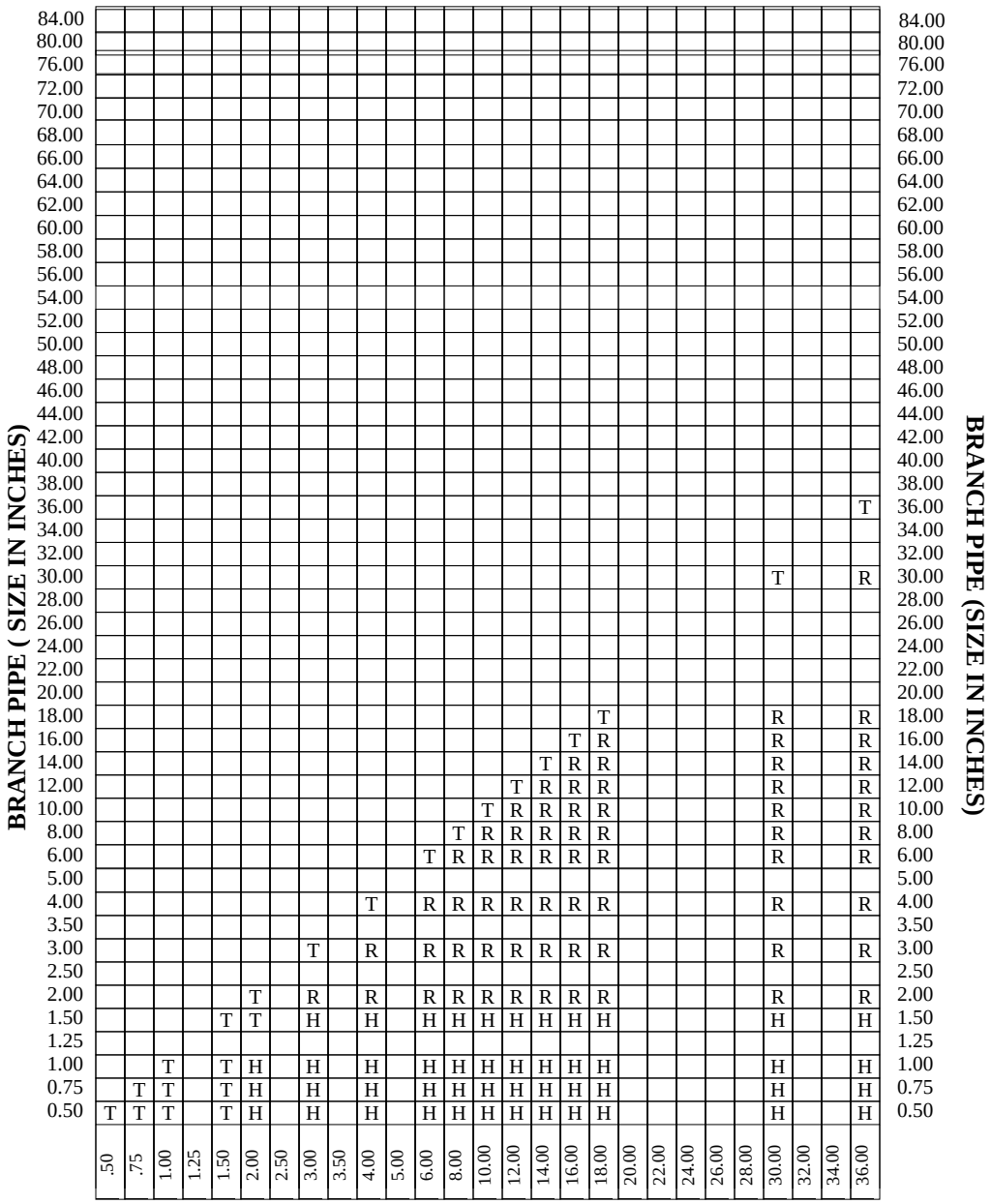
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 2 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D40A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	32
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	32
PIP	PIPE	3	8	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	10	12	S80	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	14	14	S60	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	120
PIP	PIPE	16	16	16.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	120,32
PIP	PIPE	18	18	18.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	120
PIP	PIPE	30	30	24.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	121
PIP	PIPE	36	36	28.0	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	121
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FSCD767Z5	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FWCD767Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FBCD767Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FGKD761Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FCKD761Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	

Package : IPMCS
Report No. : 50

D40A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	24	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51503	51503ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52503	52503ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53503	53503ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL. 1,TRIM-SEAT-RPTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 54503	54503ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 600,FF/125AARH	ST1753IZ5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D40A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS304	BW, T-TYPE	SP16644Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D41K** Sheet 1 of 5

PIPE CLASS : **D41K**
RATING : 600
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-196	38	93	120
PRESS	101.24	101.24	84.36	80.12

SERVICE

MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C

- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

126 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.5 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

127 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.5 KG/ CM2 G] SUBJECT TO MINIMUM OF 20 MM.

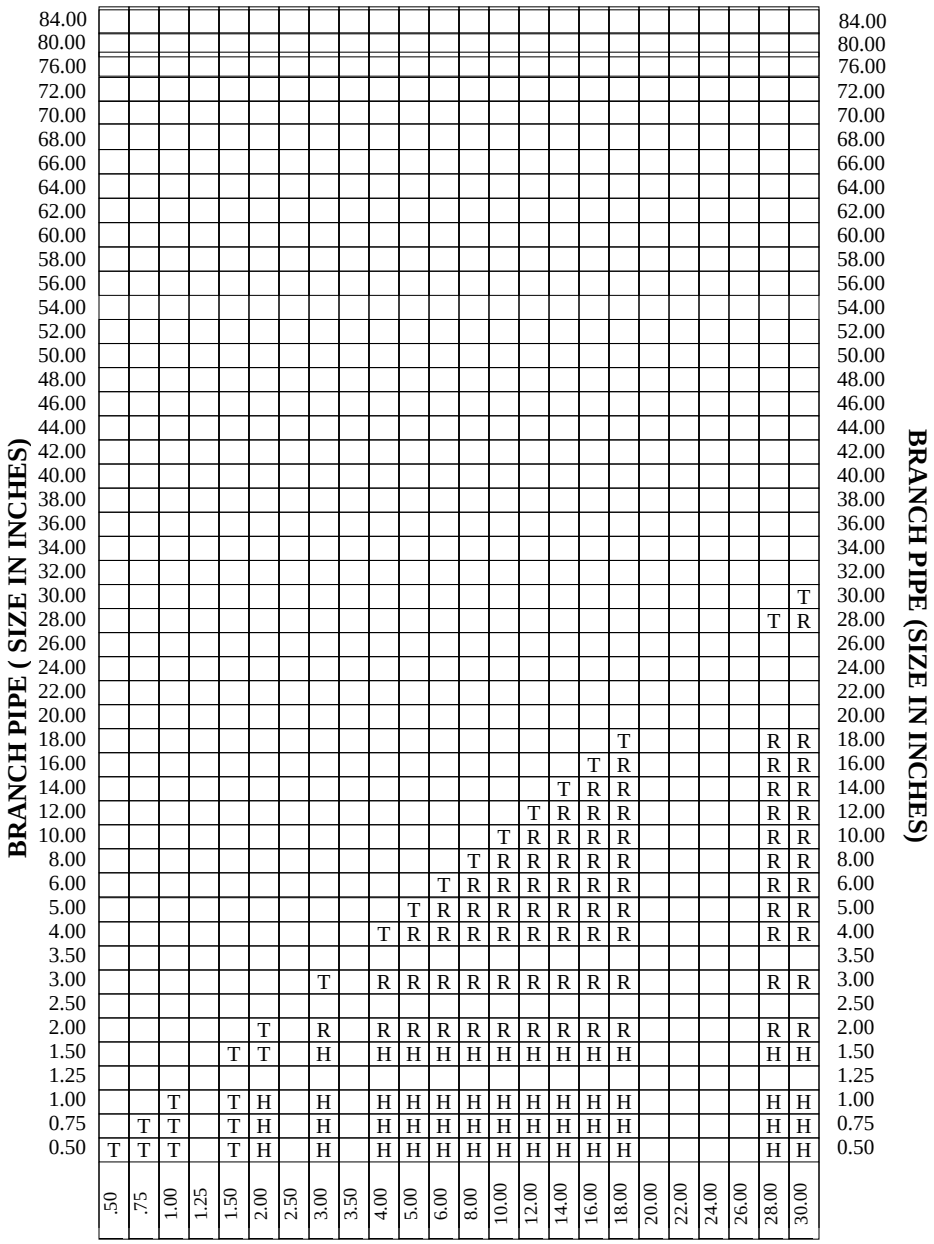
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4, DF10 (FOR LIQUID CRYOGENIC SERVICE)	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4, VF10 (FOR LIQUID CRYOGENIC SERVICE)	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :D41K** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D41K** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z4	
PIP	PIPE	2	6	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	
PIP	PIPE	8	8	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z4	126
PIP	PIPE	10	10	40S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	126
PIP	PIPE	12	14	80S	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	126
PIP	PIPE	16	16	17.0	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	126
PIP	PIPE	18	18	19.1	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	126
PIP	PIPE	28	28	20.0	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	127
PIP	PIPE	30	30	20.0	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z4	127
NIP	NIPPLE	.5	.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
NIP	NIPPLE	1	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z4	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FSC4167Z4	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FWC4167Z4	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	600, RF/125AARH	FBC4167Z4	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 182 GR.F304	600, FF/125AARH	FGK4161Z4	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 182 GR.F304	600, FF/125AARH	FCK4161Z4	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z4	
ELB90	ELBOW.90	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z14	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z14	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z4	
ELB45	ELBOW.45	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z14	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z14	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z4	
TEQ	T.EQUAL	2	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ4	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ4	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z4	
TRED	T.RED	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ4	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ4	
REDC	REDUC.CONC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ4	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ4	
REDE	REDUC.ECC	2	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ4	
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ4	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ4	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ4	
CAP	CAP	2	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ4	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z4	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z4	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z4	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z4	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 510AL	510ALZZZ4	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515AL	515ALZZZ4	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 520AL	520ALZZZ4	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-SS 316			
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525AL	525ALZZZ4	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 530AL	530ALZZZ4	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 535AL	535ALZZZ4	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SEAT-PCTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545AL	545ALZZZ4	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A320 GR.B8CL.2, NUT:A194 GR.8		BS41809Z4	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SS316+GRAFIL+SS 316 I/O RING	SPIRAL, 600	GK66476Z4	

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Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D42A** Sheet 1 of 5

PIPE CLASS : **D42A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE

CLEAN HYDROCARBONS(MIXTURE ETHYLENE/BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) -45 DEG C MINIMUM LIQUID BUTENE

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION).

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

601 FOR BALL VALVES USED,STEM SEALS SHALL BE CAPABLE OF BEING TIGHTENED WHILE UNDER PRESSURE.

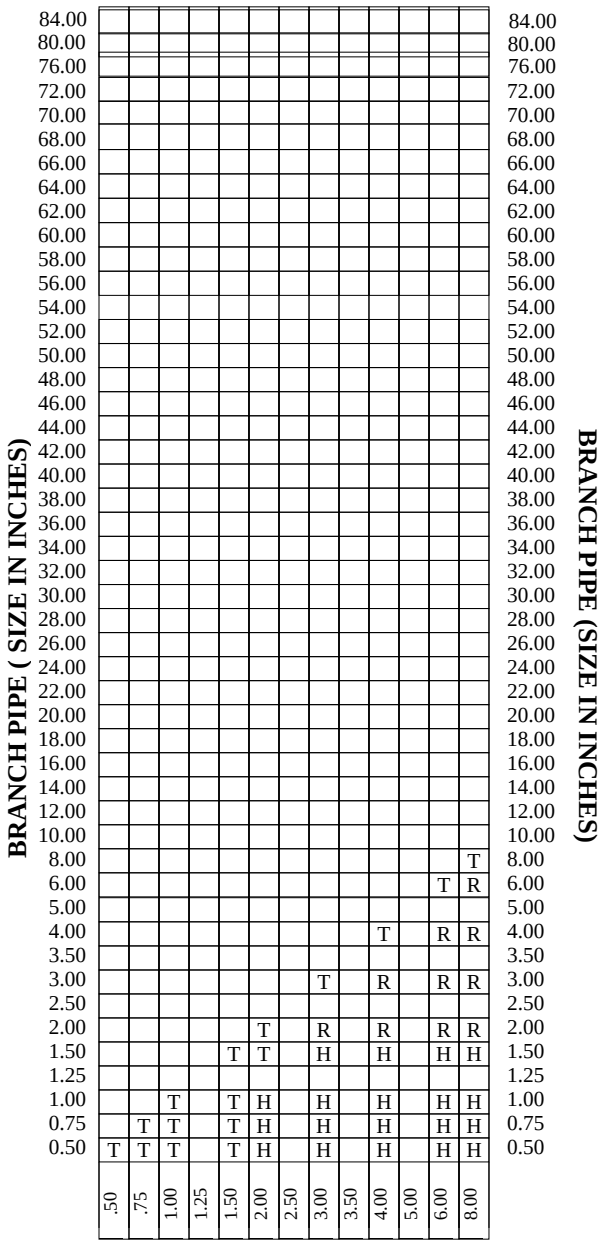
602 BALL VALVES USED SHALL BE FULL PORT TYPE AND SHALL HAVE FLANGED ENDS IN ALL SIZES.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Location BINA, MADHYA PRADESH	**Pipe Class :D42A** Sheet 2 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Location BINA, MADHYA PRADESH	**Pipe Class :D42A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	4	4	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	32
PIP	PIPE	6	8	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	10	12	CALC	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	14	14	CALC	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FSCD767Z5	
FLG	FLNG.WN	2	14	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FWCD767Z5	
FLB	FLNG.BLIND	.5	14		B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FBCD767Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FGKD761Z5	
FEF	SPCR&BLND	10	14		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FCKD761Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :D42A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	14		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51503	51503ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-SS 316			
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52503	52503ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	14		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53503	53503ZZZ5	
BLV	VLV.BALL	.5	14		BS EN ISO 17292	BODY-ASTM A 350 GR.LF2,TRIM-SEAT-RPTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 545BE	545BEZZZ5	601
Bolt Group									
BOS	BOLT.STUD	.5	14		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	14		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	14		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 600,RF/125AARH	ST1753EZ5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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PIPE CLASS : **D42K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204
PRESS	98.4	98.4	87.2	78.7	72.06

SERVICE

HYDROCARBONS, HP NITROGEN, CYCLIC PRESSURE (BASED ON LICENSOR PMS CLASS L6G5)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

735 ALL ACCESSORY GAUGES, INSTRUMENTS, ETC., SHALL BE REMOTE MOUNTED AND CONNECTED TO VALVE AT THE HEADER BY TUBING OR INTEGRAL CAPILLARY SYSTEM.

738 ALL WELDS SHALL BE 100% VISUALLY EXAMINED. ALL GROOVE AND CIRCUMFERENTIAL BUTT WELDS SHALL BE 100% EXAMINED BY RADIOGRAPHIC OR ULTRASONIC METHOD. (CONT.)

739 (CONT. FROM NOTE NO. 738) ALL SOCKET WELDS, BRANCH CONNECTIONS AND STRUCTURAL ATTACHMENT WELDS THAT ARE NOT EXAMINED BY RADIOGRAPHIC OR ULTRASONIC SHALL BE EXAMINED BY LIQUID PENETRANT OR MAGNETIC PARTICLE.
ACCEPTANCE CRITERIA IS PER ASME B31.3, NORMAL FLUID SERVICE.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

756 PIPING SYSTEMS USING THIS SPECIFICATION MAY BE SUBJECT TO VIBRATION. DESIGN AND SUPPORT OF THESE PIPING SYSTEMS SHOULD BE REVIEWED BY A STRESS ENGINEER AS PER ASME B31.3 PARAGRAPH 301.5.4.

757 IF THE NUMBER OF THERMAL DISPLACEMENT CYCLES EXCEEDS 7000 IN THE EXPECTED LIFE OF THE PIPING SYSTEM, THEN FURTHER FLEXIBILITY ANALYSIS IS REQUIRED TO DETERMINE IF SEVERE CYCLIC SERVICE CRITERIA PER ASME B31.3 MUST BE UTILIZED.

758 VALVE; GATE; API 602; CLASS 800; BUTT WELDING; SCHEDULE MATCH TO PIPE; FORGED; STAINLESS STEEL; ASTM A182 GR F316L OR DUAL GRADE F316/316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET:WELDED; API TRIM #12/12A; DISC: SOLID WEDGE; PACKING:FLEXIBLE GRAPHITE; PACKING TYPE:DIE FORMED; OPERATOR:HANDWHEEL

759 PRESSURE PULSATING SERVICES LIKE RECIPROCATING COMPRESSOR PIPING, PIPE SUPPORT LOCATIONS MUST BE DETERMINED IN CONCERT WITH ANALOG TECHNOLOGIST TO AVOID HARMONICS DUE TO VIBRATION & WITH PIPING STRESS ANALYST TO AVOID EXCESS THERMAL STRESS/STRAIN. HOLD DOWN TYPE SUPPORTS WILL TYPICALLY BE REQUIRED.

760 IN ORDER TO ELIMINATE THE OCCURRENCE OF POTENTIAL STRESS RISERS DETRIMENTAL TO PIPING IN CYCLIC SERVICES, EXTRA CARE MUST BE TAKEN DURING FABRICATION. MILL SCALE SHALL BE REMOVED FROM PIPE ENDS PRIOR TO WELDING. WHEREVER POSSIBLE, THE INSIDE SURFACE OF BUTT WELDS SHALL BE GROUND FLUSH.

761 ALL INTERNAL WELD SPLATTER AND BURRS SHALL BE REMOVED. THE GTAW WELD PROCESS SHALL BE USED FOR THE ROOT PASS OF ALL BUTT WELDS TO PROMOTE A SMOOTH INNER BORE; ROOT PENETRATION SHALL BE KEPT TO A MINIMUM.

762 ALL HOLES FOR (SET-ON STYLE) "OLETS" OR SIMILAR FITTINGS SHALL BE MACHINE CUT BY DRILLING, SAWING, OR BORING AFTER THE FITTINGS HAVE BEEN WELDED IN PLACE; A STRAIGHT BORE OLET IS REQUIRED FOR THESE APPLICATIONS.

765 CAST; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM # 10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

766 VALVE; GLOBE; ASME B16.34; CLASS 800; BUTT WELDING; SCHEDULE MATCH TO PIPE; FORGED; STAINLESS STEEL;

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ASTM A 182 GR F 316L OR DUAL GRADE F 316 / 316L; OS&Y; BONNET: WELDED; RISING STEM; API TRIM #12 / 12A; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

767 CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM # 10; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

768 VALVES ARE TO BE USED IN APPLICATIONS SUBJECT TO CHLORIDE STRESS CRACKING CONSIDERATIONS

770 CAST; FULL PORT TYPE; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

771 CAST; STAINLESS STEEL; OS&Y; RISING STEM; BONNET: BOLTED; BOLTING: ALLOY 20 (UNS N08020) W/ FINISHED NUTS; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE; API TRIM # 10; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES

772 BUTT WELDING X NPTF; STAINLESS STEEL; ASTM A 182 GR F 316L; EXTENDED BODY INTEGRALLY REINFORCED (BRANCH) END; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; OPERATOR: HANDWHEEL

773 FOR PIPING SYSTEMS SUBJECT TO VIBRATION, BRACING OF PERMANENT VENTS AND DRAINS SHOULD BE CONSIDERED

893 THIS VALVES NOT TO BE USED IN APPLICATIONS WHERE CHLORIDE STRESS IS A CONSIDERATION.

894 LICENSOR PMS L6G5 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

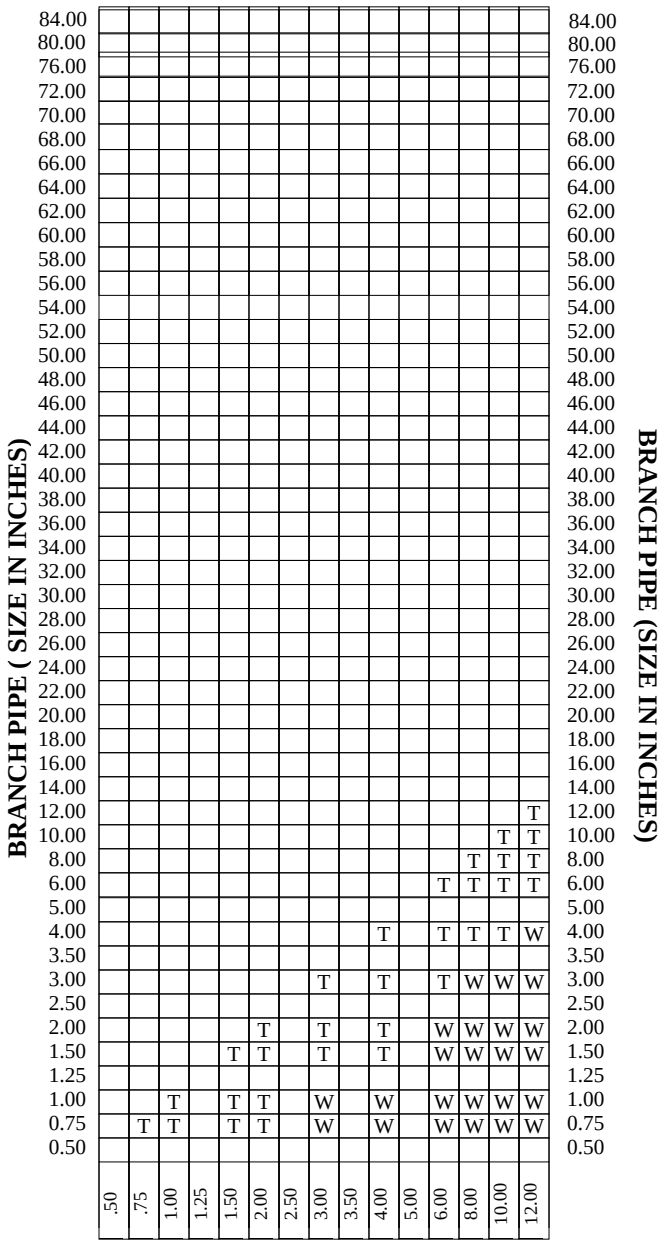
ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-894	
	ON LINES >= 2.0"	NOTE-894	
VENTS	ON LINES <= 1.5"	NOTE-894	
	ON LINES >= 2.0"	NOTE-894	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-894)	
PRESS.CONN	0.75"	NOTE-894	

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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	2	4	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	6	12	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
NIP/	NIPPLE	.75	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z0	
Flange Group									
FLG	FLNG.WN	.75	12	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FWCF767Z0	
FLB	FLNG.BLIND	.75	12		B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FBCF767Z0	
FEF	FLNG.FIG.8	.75	8		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	600, FF/125AARH	FGKF761Z0	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	600, FF/125AARH	FCKF761Z0	
Fitting Group									
ELB90	ELBOW.90	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB90	ELBOW.90	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WAGU84Z10	
ELB45	ELBOW.45	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
ELB45	ELBOW.45	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW, 1.5D	WBGU84Z10	
TEQ	T.EQUAL	.75	8	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TEQ	T.EQUAL	10	12	M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WEGU84ZZ0	
TRED	T.RED	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
TRED	T.RED	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WRGU84ZZ0	
REDC	REDUC.CONC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ0	

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Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WUGU84ZZ0	
REDE	REDUC.ECC	.75	8	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ0	
REDE	REDUC.ECC	10	12	M, M	B-16.9	ASTM A403 GR.WP304/304L-WX	BW	WVGU84ZZ0	
CAP	CAP	.75	12	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z0	
O'let Group									
WLT	WELDOLET	.75	10	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ0	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	ASTM A182 GR. F316 / ASTM A182 GR. F316L(DUAL),TRIM-SS 316+STELLITE	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 510UM	510UMZZZ0	758,742
GAV	VLV.GATE	2	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515QM	515QMZZZ0	765,742, 743
GAV/2	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510TM	510TMZZZ0	772,728
GAV/1	VLV.GATE	2	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515VM	515VMZZZ0	770,768, 742,768
GLV	VLV.GLOBE	.75	1.5		ANSI-B-16.34	ASTM A182 GR. F316 / ASTM A182 GR. F316L(DUAL),TRIM-SS 316+STELLITE	SPCL, 800, 3000, B-16.25, REFER VMS SHT, SHT NO.- 520QM	520QMZZZ0	766,742
GLV	VLV.GLOBE	2	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525QM	525QMZZZ0	767,742, 743
GLV/1	VLV.GLOBE	2	12		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525VM	525VMZZZ0	771,742, 768
Bolt Group									
BOS	BOLT.STUD	.75	12		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988

Package : IPMCS
Report No. : 50

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Location BINA, MADHYA PRADESH	**Pipe Class :D42K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.75	12		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 600	GK69776Z0	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D4A** Sheet 1 of 6

PIPE CLASS : **D4A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE

NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETHYLENE, COMONOMER (1-BUTENE / 1-HEXENE), VENT TO FLARE, RECOVERED GAS, RECOVERED LIQUID ETC.

NOTES

1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.

964 FOR LICENSOR SPECIFICATION LGP30 IN PPU, FOR SIZE RANGE 0.75" TO 1.5": STR-366 IS TO BE FOLLOWED FOR STRAINERS. SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2 FOR STRAINER SPECIFICATIONS.

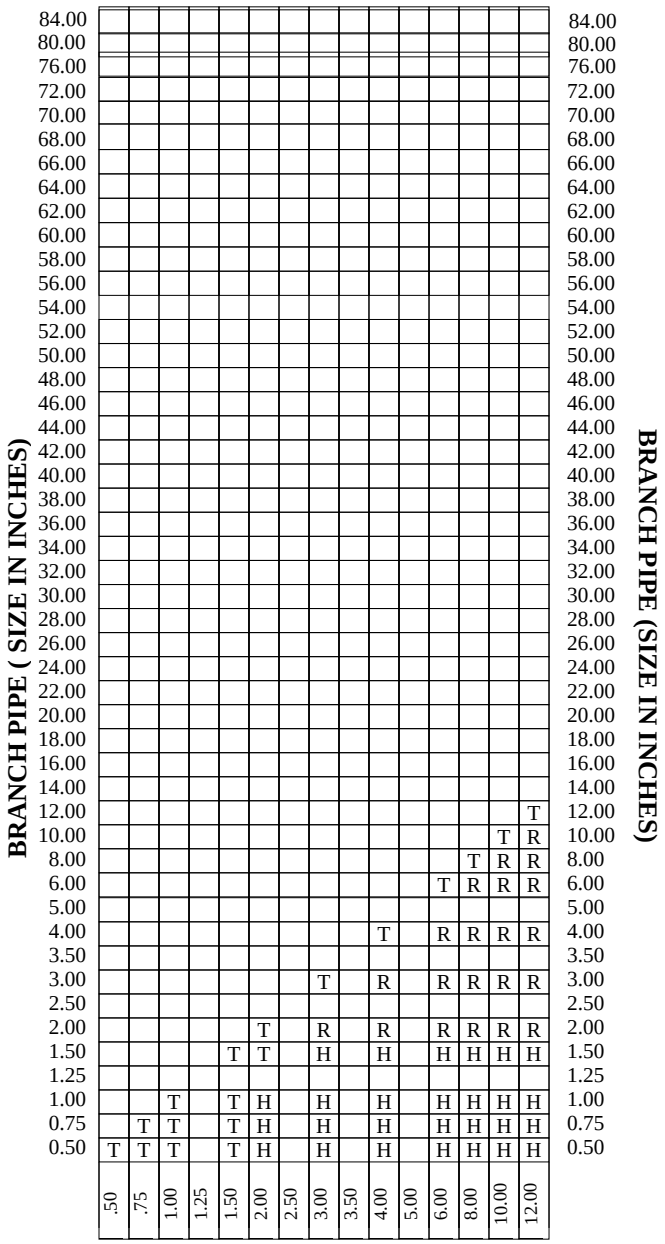
997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID. REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D4A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D4A** Sheet 3 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS	PI24677Z5	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	4	4	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	32
PIP	PIPE	6	10	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	12	12	S60	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	14	14	CALC	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS	PI24617Z5	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 671 GR.CC60 CL.32	BE, E.FS.W	PI2A313Z5	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS	PN24667Z5	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FSCD767Z5	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FWCD767Z5	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 350 GR.LF2 CL.1	600, RF/125AARH	FBCD767Z5	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FGKD761Z5	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 350 GR.LF2 CL.1	600, FF/125AARH	FCKD761Z5	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WA6T7D3Z5	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WA6T7D2Z5	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WAGB44Z15	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WAGB54Z15	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WB6T7D3Z5	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WB6T7D2Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :D4A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D	WBGB44Z15	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW, 1.5D	WBGB54Z15	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WE6T7D3Z5	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WE6T7D2Z5	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 420 GR.WPL6	BW	WEGB44ZZ5	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WEGB54ZZ5	
TRED	T.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WR6T7D3Z5	
TRED	T.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WR6T7D2Z5	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WRGB44ZZ5	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WRGB54ZZ5	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WUGB44ZZ5	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WUGB54ZZ5	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 420 GR.WPL6	BW	WVGB44ZZ5	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 420 GR.WPL6-W	BW	WVGB54ZZ5	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WNHT76ZZ5	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 350 GR.LF2 CL.1	PBE	WPHT76ZZ5	
CAP	CAP	2	24	M	B-16.9	ASTM A 420 GR.WPL6	BW	WFGB44ZZ5	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WJ6T7D3Z5	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WJ6T7D2Z5	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WK6T7D3Z5	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WK6T7D2Z5	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WL6T7D3Z5	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WL6T7D2Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :D4A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 6000	WM6T7D3Z5	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 350 GR.LF2 CL.1	SW, 3000	WM6T7D2Z5	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 51003	51003ZZZ5	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51503	51503ZZZ5	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL. 1,TRIM-STELLITED,STEM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 52003	52003ZZZ5	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED,STEM-SS 316	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52503	52503ZZZ5	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 350 GR.LF2 CL.1,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53003	53003ZZZ5	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 352 GR.LCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53503	53503ZZZ5	
BLV	VLV.BALL	.5	16		BS EN ISO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL. 1,TRIM-SEAT-RPTFE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 54503	54503ZZZ5	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.7		BS42034Z5	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z5	
Trap/Strainer Group									
TSR	STRNR.TEMP	1.5	24		EIL'STD	B:A516GR.70(NORM);INT:SS304	CONETYPE, 600,FF/125AARH	ST1753IZ5	
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A350GR.LF2 CL.1;INT:SS304	SW, Y-TYPE, 800	SP3D9D515	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A420GR.WPL6;INT:SS304	BW, T-TYPE	SP16544Z5	

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Location BINA, MADHYA PRADESH	**Pipe Class :D4A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A420GR.WPL6W; INT:SS304	BW, T-TYPE	SP16644Z5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D54K** Sheet 1 of 5

PIPE CLASS : **D54K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : CRYOGENIC SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-101	38	65	93	149	204	260	316	343	371
PRESS	51.7	51.7	58	51.7	51.7	51.7	51.7	51.7	51.7	51.7

SERVICE

HYDROGEN (BASED ON LICENSOR PMS CLASS - LPZ17)

NOTES

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

28 VALVE STEM ORIENTATION SHALL BE MAINTAINED AT OR ABOVE 45 DEGREE ABOVE THE HORIZONTAL POSITION IN LIQUID CRYOGENIC SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

743 THIS VALVE SHALL NOT BE USED IN APPLICATIONS WHERE CHLORIDE STRESS CRACKING IS A CONSIDERATION

763 IN ADDITION TO THOSE TESTS REQUIRED IN ACCORDANCE WITH ASME B31.3, PIPING IN THIS SPECIFICATION MAY BE SUBJECTED TO A SENSITIVE LEAK TEST

764 BOLT LUBRICANT; PASTE BOLT LUBRICANT; 60% MOLYBDENUM DISULFIDE PLUS OTHER SOLIDS SUCH AS: DOW CORNING MOLYKOTE GN

773 FOR PIPING SYSTEMS SUBJECT TO VIBRATION, BRACING OF PERMANENT VENTS AND DRAINS SHOULD BE CONSIDERED

792 VALVE; GATE; API 602; CLASS 800; SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; BELLOWS TYPE; BONNET: WELDED; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; BELLOWS: FORMED MULTI-LAYER 321 STAINLESS STEEL; OPERATOR: HANDWHEEL; FOR LOW EMISSION SERVICE

793 VALVE; GATE; API 600; CLASS 600; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; BELLOWS TYPE; FULL PORT TYPE; OS&Y; BONNET: BOLTED AND SEAL WELDED; BOLTING: ASTM A 193 GR B8; GASKET: METAL; API TRIM #16; (CONT.)

794 (CONT. FROM NOTE NO. 793) DISC: FLEXIBLE WEDGE; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; BELLOWS: FORMED MULTI-LAYER 321 STAINLESS STEEL; OPERATOR: HANDWHEEL TO NPS 3, GEAR LARGER SIZES; FOR LOW EMISSION SERVICE;

795 SOCKET WELDING; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; BELLOWS TYPE; OS&Y; BONNET: WELDED; API TRIM #8 /8A; HARD FACED DISC; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; BELLOWS: FORMED MULTI-LAYER 321 STAINLESS STEEL; OPERATOR: HANDWHEEL; FOR LOW EMISSION SERVICE

797 VALVE; GLOBE; ASME B16.34; CLASS 600; RAISED FACE; FLANGED; CAST; STAINLESS STEEL; ASTM A 351 GR CF8M; BELLOWS TYPE; OS&Y; BONNET: BOLTED; BOLTING: ASTM A 193 GR B8; GASKET: CONFINED GRAPHITE OR METAL OR METAL WITH GRAPHITE (CONT.)

798 (CONT. FROM NOTE NO.797) API TRIM #12 / 12A; HARD FACED DISC; PACKING: FLEXIBLE GRAPHITE; PACKING TYPE: DIE FORMED; BELLOWS: FORMED MULTI-LAYER 321 STAINLESS STEEL; OPERATOR: HANDWHEEL TO NPS 3, GEAR

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LARGER SIZES; FOR LOW EMISSION SERVICE;

799 SCHEDULE 80; STAINLESS STEEL; ASTM A 351 GR CF8M OR ASTM A479 GR 316 / 316L; WAFER INSERT TYPE; SEATING: METAL; SPRING: INCONEL-X; CLASS 600 CHECK-ALL WAFER INSERT VALVE MAY BE BOLTED BETWEEN CLASS 150 OR CLASS 300 FLANGES OR CLASS 600 FLANGES; TO BE USED WITH SCHEDULE 80 OR THINNER WALL PIPE.

800 REQUISITIONER MUST SPECIFY CRACKING PRESSURE FURNISH WITH APPROVED RIVETED-ON EXTERNAL IDENTIFICATION TAG;

802 SOCKET WELD X NPTF; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; BELLOWS TYPE; BONNET: WELDED; API TRIM #8 / 8A; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; BELLOWS: FORMED MULTI-LAYER 321 STAINLESS STEEL; OPERATOR: HANDWHEEL FOR LOW EMISSION SERVICE;

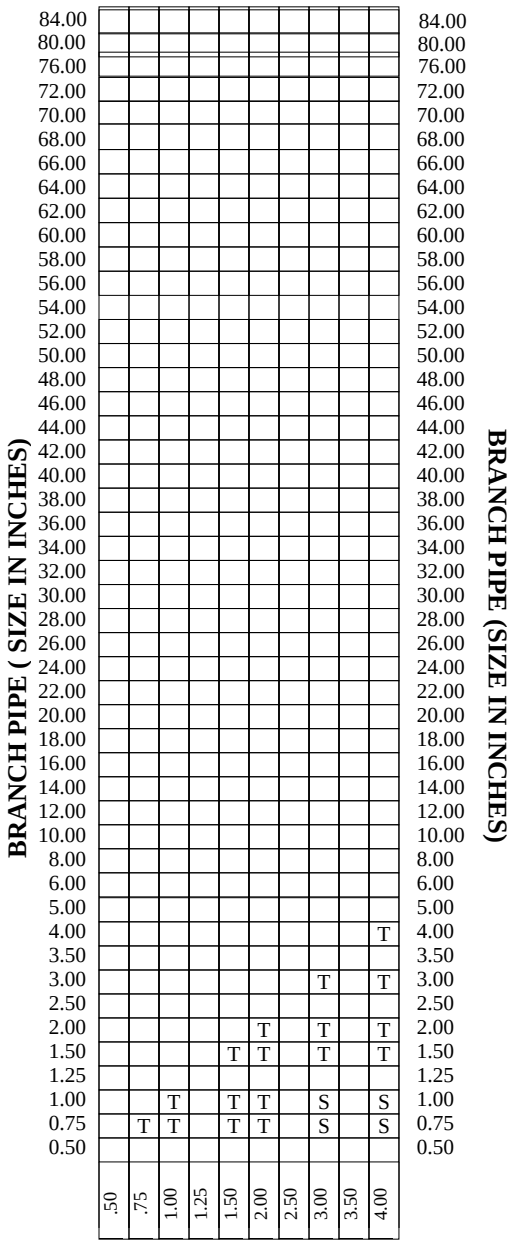
927 LICENSOR PMS LPZ17 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-927,28	
	ON LINES >= 2.0"	NOTE-927,28	
VENTS	ON LINES <= 1.5"	NOTE-927,28	
	ON LINES >= 2.0"	NOTE-927,28	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-927)	
PRESS.CONN	0.75"	NOTE-927,28	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D54K** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D54K

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Client :BPCL	**Dept./Sect. :** 16/43
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Location BINA, MADHYA PRADESH	**Pipe Class :D54K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z4	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z4	
PIP	PIPE	2	4	40S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z4	
NIP/	NIPPLE	.75	4	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z4	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FSCD867Z4	
FLG	FLNG.WN	.5	.5	40S	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FWCD867Z4	
FLG	FLNG.WN	2	4	M	B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FWCD867Z4	
FLB	FLNG.BLIND	.5	4		B-16.5	ASTM A 182 GR.F304/304L	600, RF/125AARH	FBCD867Z4	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F304/304L	600, FF/125AARH	FGKD861Z4	
Fitting Group									
ELB90	ELBOW.90	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z4	
ELB90	ELBOW.90	2	4	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z14	
ELB45	ELBOW.45	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z4	
ELB45	ELBOW.45	2	4	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z14	
TEQ	T.EQUAL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z4	
TEQ	T.EQUAL	2	4	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ4	
TRED	T.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z4	
TRED	T.RED	2	4	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ4	
REDC	REDUC.CONC	2	4	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ4	
REDE	REDUC.ECC	2	4	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ4	
SWGC	SWAGE.CONC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ4	
SWGE	SWAGE.ECC	.75	3	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ4	
CAP	CAP	2	4	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ4	

Package : IPMCS
Report No. : 50

D54K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D54K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
PLG	PLUG	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z4	307
CPLF	CPLNG.FULL	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z4	
CPLH	CPLNG.HALF	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z4	
CPLL	CPLNG.LH	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z4	
CPLR	CPLNG.RED	.75	1.5		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z4	
O'let Group									
SLT	SOCKOLET	.75	1.5		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z4	
WLT	WELDOLET	2	2	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ4	
Valves Group									
GAV	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 510QQ	510QQZZZ4	792,725, 12,742
GAV	VLV.GATE	2	4		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515QQ	515QQZZZ4	793,794, 726,743, 12,742
GAV/1	VLV.GATE	.75	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-13%CR STEEL+STELLITED	SPCL, 800, 3000, B-16.11, REFER VMS SHT, SHT NO.- 510TN	510TNZZZ4	802,725, 728,12
GLV	VLV.GLOBE	.75	1.5		ANSI-B-16.34	BODY-ASTM A 182 GR.F316L,TRIM-13%CR STEEL+STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 520QQ	520QQZZZ4	795,12,742
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525QQ	525QQZZZ4	797,798, 743,12,742
CHV	VLV.CHECK	.75	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,SEAT-METAL, SPRING-INCONEL-X	WAFL, 600, B-16.5, WAF/125AARH, SHT NO.- 535QQ	535QQZZZ4	799,705, 800,742
Bolt Group									
BOS	BOLT.STUD	.75	4		B-18.2	BOLT:A193 GR.B8CL.2, NUT:A194 GR.8A		BS43610Z4	764
Gasket Group									
GAS	GASKET	.75	4		B-16.20-ANSI B16.5	SS304+GRAFIL+SS 304 I/O RING	SPIRAL, 600	GK6AN76Z4	731

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Location BINA, MADHYA PRADESH	**Pipe Class :D55A** Sheet 1 of 6

PIPE CLASS : **D55A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	190
PRESS	94.9	94.9	94.9	92.1	89.3

SERVICE

HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP31)

NOTES

15 FOR LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C, POST WELD HEAT TREATMENT IS REQUIRED FOR ALL WELD JOINTS IRRESPECTIVE OF THICKNESS.

16 DESIGN TEMPERATURE FOR THIS CLASS CAN BE HIGHER THAN 230 DEG. C, PROVIDED THE MATERIAL IS SUITABLE FOR HYDROGEN PARTIAL PRESSURE AND MAXIMUM OPERATING TEMPERATURE OF THE SERVICE AS PER NELSON CURVE API RP 941.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

600 USE ONLY FOR INSTRUMENTATION CONNECTION.

705 TAPPED LUG WAFER CHECK VALVES TO BE USED.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

815 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.
FOR SIZE RANGE 3/4" TO 1" : STR-366 IS TO BE FOLLOWED

832 SHUT-OFF SERVICE; 6000 PSI; SPECIAL UNION ENDS; OUTSIDE SCREW; RISING STEM; RISING HANDWHEEL; BONNET: THREADED; STEM: 316 STAINLESS STEEL GUIDE ASSEMBLY: COPPER NICKEL WITH VESPEL DISC; SEAT: MONEL; PACKING: BUNA-N; BODY O-RING: BUNA-N WITH PTFE BACK UP RING; SEAT O-RING: BUNA-N

833 PREPARED FOR GAS PHASE PP SERVICE

834 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 380-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS.

835 VALVE; CHECK; UNIBODY; SPRING LOADED AXIALLY OPENING DISC; 6000 PSI; SPECIAL UNION ENDS; BODY: ASTM B150 ALUMINUM BRONZE; SEAT / DISC: 304 STAINLESS STEEL; SEAT O-RING: BUNA-N; DISC O-RING: BUNA-N

836 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 123-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS.

840 USE FOR VENTS AND DRAINS WITH CPV- 'O-SEAL' BLANK FITTING FIGURE NUMBER 104R WITH O-RING.

841 VALVE; GLOBE; NEEDLE SERVICE; 6000 PSI; SPECIAL UNION ENDS; OUTSIDE SCREW; RISING STEM; RISING HANDWHEEL; BONNET: THREADED; STEM: 316 STAINLESS STEEL GUIDE ASSEMBLY: COPPER NICKEL WITH VESPEL DISC; SEAT: MONEL; PACKING: BUNA-N; BODY O-RING: BUNA-N WITH PTFE BACK UP RING; SEAT O-RING: BUNA-N;

842 APPROVED MANUFACTURING IS CPV MANUFACTURING, INC. -FIGURE NUMBER 480-M; VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES FIGURE NUMBER 51R AND O-RINGS. (CONT.)

843 (CONT. FROM NOTE NO. 842) VALVE IS TO BE PURCHASED WITH UNION NUT, APPROPRIATE TAIL PIECE FOR TUBING CONNECTION AND O-RING. CONSULT MANUFACTURERS CATALOG FOR APPROPRIATE TAILPIECE FIGURE NUMBER.

948 LICENSOR PMS LGP31 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS

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DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

957 WITH FLEXITE SUPER (MICA / GRAPHITE) GASKET AND STAINLESS STEEL RETAINER.

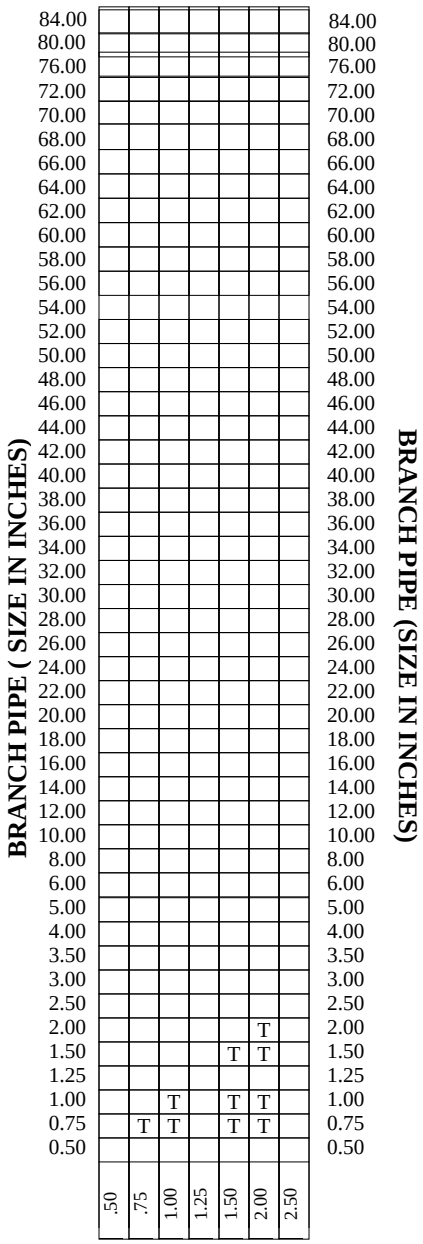
988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-948	
	ON LINES >= 2.0"	NOTE-948	
VENTS	ON LINES <= 1.5"	NOTE-948	
	ON LINES >= 2.0"	NOTE-948	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-948)	
PRESS.CONN	0.75"	NOTE-948	

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RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

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D55A

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Location BINA, MADHYA PRADESH	**Pipe Class :D55A** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
NIP	NIPPLE	.75	.75	S160	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
NIP	NIPPLE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z7	
FLG	FLNG.WN	.5	.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z7	
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z7	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z7	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z7	
Fitting Group									
ELB90	ELBOW.90	.75	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB45	ELBOW.45	.75	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	
TEQ	T.EQUAL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TRED	T.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	

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Location BINA, MADHYA PRADESH	**Pipe Class :D55A** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGC	SWAGE.CONC	.75	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	
SWGE	SWAGE.ECC	.75	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
CPLF	CPLNG.FULL	.75	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z7	
CPLH	CPLNG.HALF	.75	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z7	
CPLL	CPLNG.LH	.75	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z7	
CPLR	CPLNG.RED	.75	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z7	
UNN	UNION	.75	.75		MSS-SP83	ASTM A 105	SW, 6000	WQR02D3Z7	957
UNN	UNION	1	1.5		MSS-SP83	ASTM A 105	SW, 3000	WQR02D2Z7	957
O'let Group									
SLT	SOCKOLET	.75	.75		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z7	
SLT	SOCKOLET	1	1.5		MSS-SP97	ASTM A 105	SW, 3000	YSS02D2Z7	
Valves Group									
GLV	VLV.GLOBE	.75	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),STEM-SS 316,SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-525PR	525PRZZZ7	832,833, 834,840, 742
GLV/1	VLV.GLOBE	.75	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),STEM-SS 316,SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-525QR	525QRZZZ7	841,833, 842,843, 600
CHV	VLV.CHECK	.75	2		MNF'STD	ALUMINIUM BRONZE (ASTM B150),TRIM-SS 304	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-535PR	535PRZZZ7	835,833, 836,742
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H		BS44938Z7	988

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Location BINA, MADHYA PRADESH	**Pipe Class :D55A** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
						(PTFE COATED)			
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 600	GK66376Z7	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D5A** Sheet 1 of 5

PIPE CLASS : **D5A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : HYDROGEN SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	230
PRESS	104.05	104.05	95.6	92.09	88.92	86.96

SERVICE

HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE & NON-LETHAL.

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

15 FOR LINES WITH DESIGN TEMPERATURE GREATER THAN 204 DEG. C, POST WELD HEAT TREATMENT IS REQUIRED FOR ALL WELD JOINTS IRRESPECTIVE OF THICKNESS.

16 DESIGN TEMPERATURE FOR THIS CLASS CAN BE HIGHER THAN 230 DEG. C, PROVIDED THE MATERIAL IS SUITABLE FOR HYDROGEN PARTIAL PRESSURE AND MAXIMUM OPERATING TEMPERATURE OF THE SERVICE AS PER NELSON CURVE API RP 941.

17 FOR HYDROGEN SERVICE, CARBON STEEL PIPING MATERIALS WITH WALL THICKNESS 3/8 INCH AND OVER SHALL BE NORMALISED.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

62 ANY MEDIUM CONTAINING HYDROGEN GAS WITH A PARTIAL PRESSURE OF 100 PSI & ABOVE SHALL BE CONSIDERED AS HYDROGEN SERVICE.

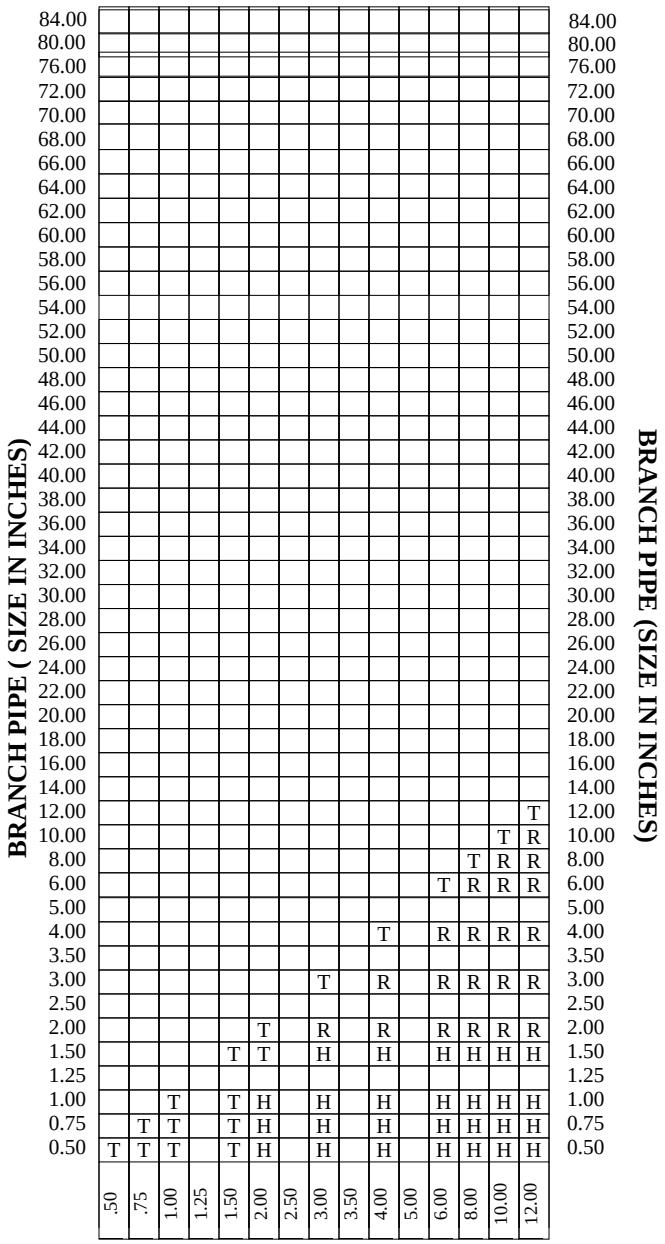
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Project :MPMC & EPCM-1 FOR BPREP	
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CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D5A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D5A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z7	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	3	3	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	4	8	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	10	12	S80	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	26
PIP	PIPE	14	14	CALC	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z7	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 672 GR.B60 CL.32	BE, E.FS.W	PI2B113Z7	
NIP	NIPPLE	.5	.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
NIP	NIPPLE	1	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z7	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z7	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z7	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z7	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z7	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	600, FF/125AARH	FCK0161Z7	
Fitting Group									
ELB90	ELBOW.90	.5	.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z7	
ELB90	ELBOW.90	1	1.5		B-16.11	ASTM A 105	SW, 3000	WA602D2Z7	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z17	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z17	
ELB45	ELBOW.45	.5	.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z7	
ELB45	ELBOW.45	1	1.5		B-16.11	ASTM A 105	SW, 3000	WB602D2Z7	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z17	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D5A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z17	
TEQ	T.EQUAL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z7	
TEQ	T.EQUAL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WE602D2Z7	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ7	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ7	
TRED	T.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z7	
TRED	T.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WR602D2Z7	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ7	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ7	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ7	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ7	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ7	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ7	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ7	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ7	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ7	
CPLF	CPLNG.FULL	.5	.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z7	
CPLF	CPLNG.FULL	1	1.5		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z7	
CPLH	CPLNG.HALF	.5	.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z7	
CPLH	CPLNG.HALF	1	1.5		B-16.11	ASTM A 105	SW, 3000	WK602D2Z7	
CPLL	CPLNG.LH	.5	.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z7	
CPLL	CPLNG.LH	1	1.5		B-16.11	ASTM A 105	SW, 3000	WL602D2Z7	
CPLR	CPLNG.RED	.5	.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D5A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	1	1.5		B-16.11	ASTM A 105	SW, 3000	WM602D2Z7	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51004	51004ZZZ7	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 51504	51504ZZZ7	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52004	52004ZZZ7	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52504	52504ZZZ7	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53004	53004ZZZ7	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53504	53504ZZZ7	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z7	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z7	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D517	
PSR	STRNR.PERM	2	14	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z7	
PSR	STRNR.PERM	16	24	M	EIL'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE	SP13644Z7	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D69M** Sheet 1 of 4

PIPE CLASS : **D69M**
RATING : 600
BASE MATERIAL : SS 316/316L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260
PRESS	101.24	101.24	87.18	78.74	72.06	67.14

SERVICE

SPENT CAUSTIC

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

75 BALL VALVES SHALL NOT BE USED IN CAUSTIC SERVICE.

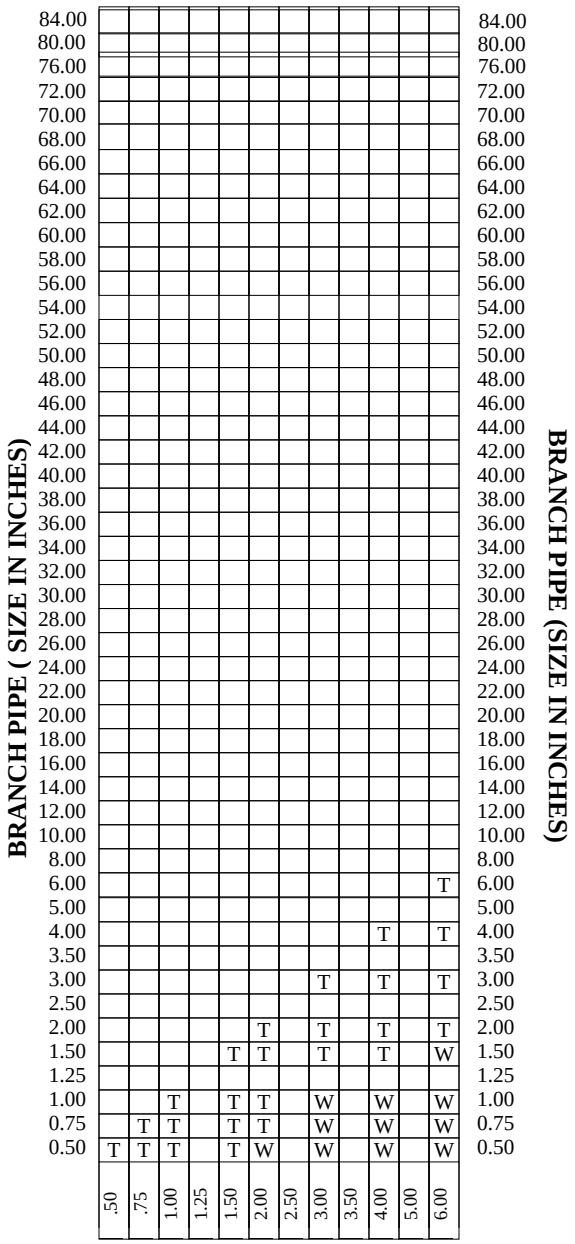
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH SINGLE VALVE (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D69M** Sheet 2 of 4



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D69M

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D69M** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	80S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	1	1.5	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
PIP	PIPE	2	6	40S	B-36.19	ASTM A312 GR.TP316/316L DUAL	BE, SEAMLESS	PI3Q917Z0	
NIP/	NIPPLE	.5	.75	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
NIP/	NIPPLE	1	1.5	M	B-36.19	ASTM A312 GR.TP316/316L DUAL	PBE, SEAMLESS	PN3Q967Z0	
Flange Group									
FLG	FLNG.WN	.5	6	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FWCF767Z0	
FLB	FLNG.BLIND	.5	6		B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FBCF767Z0	
FEF	FLNG.FIG.8	.5	6		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	600, FF/125AARH	FGKF761Z0	
Fitting Group									
ELB90	ELBOW.90	.5	6	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WAGX24Z10	
ELB45	ELBOW.45	.5	6	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW, 1.5D	WBGX24Z10	
TEQ	T.EQUAL	.5	6	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WEGX24ZZ0	
TRED	T.RED	.5	6	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WRGX24ZZ0	
REDC	REDUC.CONC	.5	6	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WUGX24ZZ0	
REDE	REDUC.ECC	.5	6	M, M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WVGX24ZZ0	
CAP	CAP	.5	6	M	B-16.9	ASTM A403 GR.WP316/316L-S DUAL	BW	WFGX24ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D69M** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
WLT	WELDOLET	.5	6	M, M	MSS-SP97	ASTM A182 GR.F316/316L DUAL	BW	YWSX14ZZ0	
Valves Group									
GAV	VLV.GATE	.5	6		API 600/ ISO 10434	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 515DN	515DNZZZ0	
GLV	VLV.GLOBE	.5	6		BS-1873	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 525DN	525DNZZZ0	
CHV	VLV.CHECK	.5	6		BS-1868	BODY-ASTM A 351 GR.CF8M,TRIM-SS 316+STELLITE	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 535DN	535DNZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	6		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	6		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 1 of 6

PIPE CLASS : **D81K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-40	38	66	93	110	149
PRESS	101.24	101.24	92.8	84.37	81.69	75.57

SERVICE

ALKYL, PRODIGYTM BMC CATALYST, MODIFIER D (BASED ON LICENSOR PMS CLASSES - 7E28 & 7G28).

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.35 AND ASTM A 370.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

311 USE FOR ONLY THERMOWELL CONNECTION.

345 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE THREAD DOPE WHERE SEAL WELDING AND COVER ALL EXPOSED THREADS WITH WELD.

377 LICENSOR REFERENCE [PPF-2] FOR REQUIREMENTS FOR PIPING IN LOW TEMPERATURE SERVICE.

528 DUAL STAMP SHALL BE REQUIRED FOR ALL MATERIALS WHERE 2 GRADES OF MATERIAL ARE REQUIRED.

560 ALL WETTED ROOT BEAD SURFACES AND ADJACENT AREAS, SHALL BE 100% INSPECTED BY VISUAL EXAMINTION AND PROVEN TO BE FREE OF ANY INTERNAL WELD BEAD PROTRUSION (FLUSH WITH I.D.) AND FREE OF ANY CREVICE OR ROUNDED TYPE DISCONTINUITY.

561 GTAW SHALL BE USED FOR THE ROOT PASS OF ALL BUTT WELDS ON NPS 1 AND SMALLER. ROOT PENETRATION SHALL BE KEPT AT A MINIMUM.

629 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 7E28

658 REFER LICENSOR SPECIFICATION FOR STR-419 FOR STRAINERS.

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

981 TO BE USED IN CHLORINATED HYDROCARBON SERVICE

982 DO NOT USE IN CHLORINATED HYDROCARBON SERVICE

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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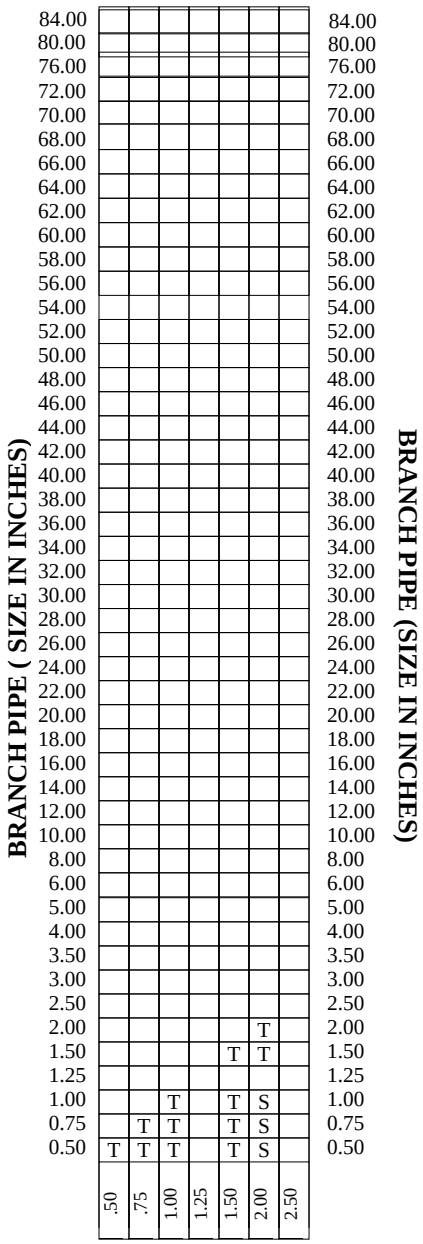
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 2 of 6

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SW COUPLING	
	1.5" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EILSTD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EILSTD 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EILSTD 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EILSTD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 3 of 6



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D81K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 4 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z5	
PIP	PIPE	1.5	2	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z5	
NIP	NIPPLE	.5	1	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z5	
Flange Group									
FLG	FLNG.SW	.5	1	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FSCF767Z5	
FLG	FLNG.WN	1.5	2	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FWCF767Z5	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 182 GR.F316/316L DUAL	600, RF/125AARH	FBCF767Z5	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	600, FF/125AARH	FGKF761Z5	
Fitting Group									
ELB90	ELBOW.90	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z5	
ELB90	ELBOW.90	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z15	
ELB45	ELBOW.45	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z5	
ELB45	ELBOW.45	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z15	
TEQ	T.EQUAL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z5	
TEQ	T.EQUAL	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ5	
TRED	T.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z5	
TRED	T.RED	1.5	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ5	
REDC	REDUC.CONC	1.5	2	M, M	B-16.9	ASTM A182 GR.F304/304L	BW	WUGU64ZZ5	
REDE	REDUC.ECC	1.5	2	M, M	B-16.9	ASTM A182 GR.F304/304L	BW	WVGU64ZZ5	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ5	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ5	
CAP	CAP	.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ5	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 5 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	.5	1		B-16.11	ASTM A182 GR.F304/304L	SCRF, 3000	WF6U682Z5	
PLG	PLUG	.5	1		B-16.11	ASTM A182 GR.F304/304L	SCRM, 3000	WH6U692Z5	
CPLF	CPLNG.FULL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z5	
CPLH	CPLNG.HALF	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z5	
CPLL	CPLNG.LH	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z5	
CPLR	CPLNG.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z5	
O'let Group									
SLT	SOCKOLET	.5	1		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z5	
WLT	WELDOLET	1.5	2	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ5	
ELT	ELBOWLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YESU64ZZ5	311
LLT	LATROLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YLSU64ZZ5	311
Valves Group									
CHV	VLV.CHECK	.5	.5		API 602/ ISO 15761	BODY-ASTM A 351 GR.CF3M,TRIM-SS 316	SW, 800, 3000, B-16.11, SHT NO.- 530LP	530LPZZZ5	629
CHV	VLV.CHECK	.75	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,SPRING-SS316; SEAT-INTEGRAL METAL	WAF, 600, B-16.5, WAF/125AARH, SHT NO.- 535LP	535LPZZZ5	629
CHV/1	VLV.CHECK	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,SEATS-PTFE O-RING; SPRING- SS316	WAF, 600, B-16.5, WAF/125AARH, SHT NO.- 535MP	535MPZZZ5	629
BLV	VLV.BALL	.5	2		MNF'STD	BODY-ASTM A 351 GR.CF3M,BALL +STEM- SS316; SEATS- RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540NP	540NPZZZ5	982,629
BLV	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,BALL+STEM- SS316; SEATS- RPTFE	BW, 600, B-16.25, SHT NO.- 545LP	545LPZZZ5	982,629
BLV/9	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,BALL+STEM- SS316; SEATS- RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540LP	540LPZZZ5	982,629
BLV/8	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,TRIM- SS 316; SEAT- RPTFE	BW, 600, B-16.25, SHT NO.- 545CP	545CPZZZ5	982,629

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D81K** Sheet 6 of 6

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV/7	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT - RPTFE	BW, 600, B-16.25, SHT NO.- 545NP	545NPZZZ5	981,629
BLV/6	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT- RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540BP	540BPZZZ5	981,629
BLV/5	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT- RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540CP	540CPZZZ5	981,629
BLV/4	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT- RPTFE	BW, 600, B-16.25, SHT NO.- 545DP	545DPZZZ5	981,629
BLV/3	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,STEM-MONEL; SEAT- RPTFE	SW, 800, 3000, B-16.11, SHT NO.- 540DP	540DPZZZ5	981,629
BLV/1	VLV.BALL	.5	2		ANSI-B-16.34	BODY-ASTM A 351 GR.CF3M,BALL+STEM- SS316 ; SEAT- RPTFE	SPCL, 800, 3000, MNF'STD, REFER VMS SHT, SHT NO.- 540MP	540MPZZZ5	982,629
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A320 GR.L7 (HDG), NUT:A194 GR.7 (HDG)		BS44231Z5	
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z5	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A351GR.CF8M;INT:SS316	SW, Y-TYPE, 800	SP3A1D515	658

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D9A** Sheet 1 of 5

PIPE CLASS : **D9A**
RATING : 600
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	104.05	104.05	95.6	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58

SERVICE

MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, PROCESS WET LIQUID DRAIN,.ETC.

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

129 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.50 KG/ CM2 G] SUBJECT TO MINIMUM OF 80% CLASS RATING.

130 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.5 KG/ CM2 G] SUBJECT TO MINIMUM OF 20 MM THICKNESS.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

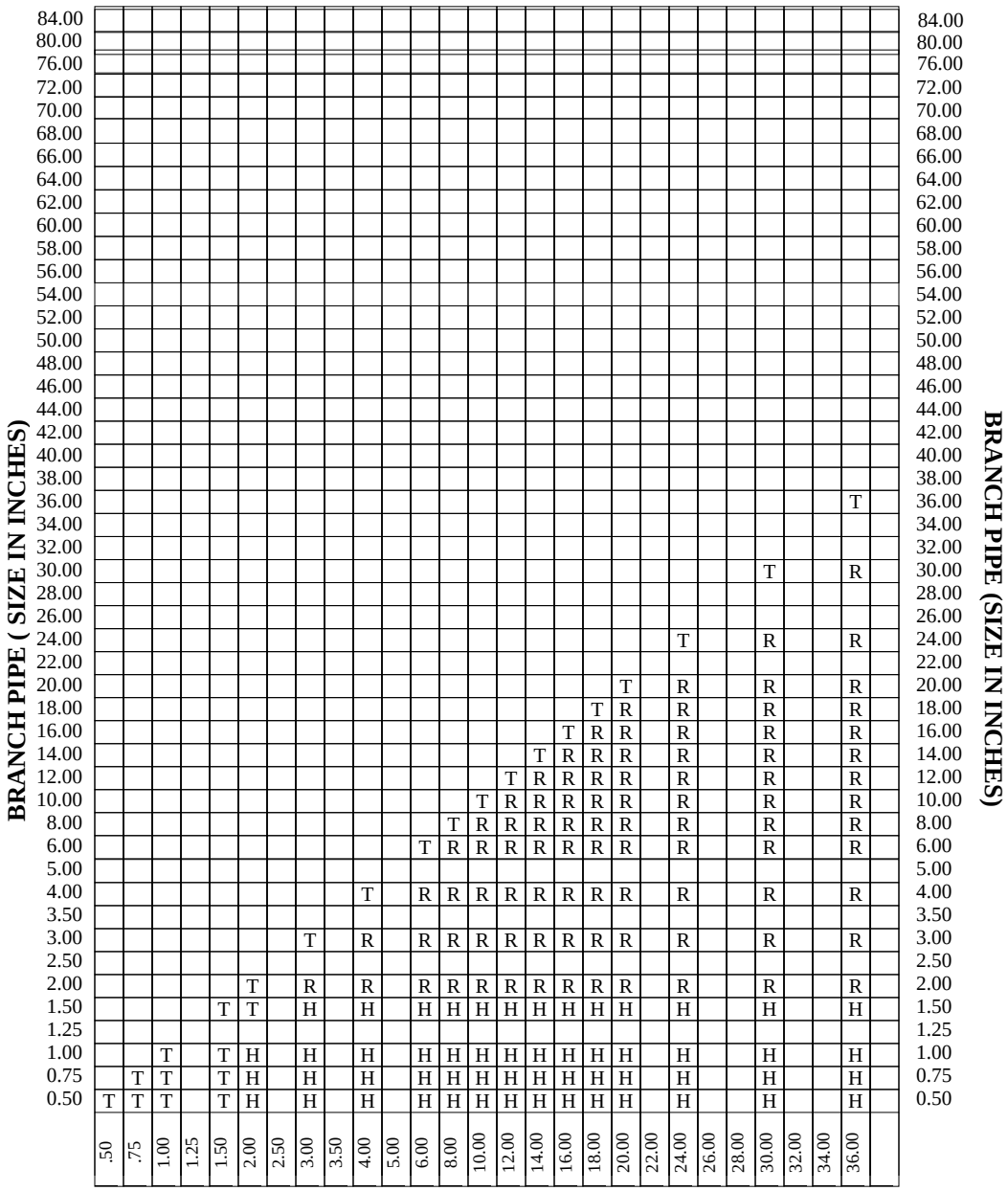
160 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [65 DEG. C & 64.5 KG/ CM2 G] .

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW WITH VALVE TO SPEC. INSTALLATION AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D9A** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

D9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D9A** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3	8	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	10	12	S80	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	26
PIP	PIPE	14	14	S60	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	129,32
PIP	PIPE	16	16	18.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	129
PIP	PIPE	18	18	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	130
PIP	PIPE	20	20	20.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	130
PIP	PIPE	24	24	S60	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	160
PIP	PIPE	30	30	24.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	160
PIP	PIPE	36	36	28.0	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z0	160,3
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	.5	1.5	M	B-16.5	ASTM A 105	600, RF/125AARH	FSC0167Z0	
FLG	FLNG.WN	2	24	M	B-16.5	ASTM A 105	600, RF/125AARH	FWC0167Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	600, RF/125AARH	FBC0167Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105	600, FF/125AARH	FGK0161Z0	
FEF	SPCR&BLND	10	24		ASME-B16.48	ASTM A 105	600, FF/125AARH	FCK0161Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	

Package : **IPMCS**
Report No. : **50**

D9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D9A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	2	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	1.5		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, NA	WH6029ZZ0	
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
Valves Group									
GAV	VLV.GATE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	
GAV	VLV.GATE	2	24		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB,TRIM-	FLGD, 600, B-16.5, RF/125AARH, SHT	51501ZZZ0	

Package : IPMCS
Report No. : 50

D9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :D9A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
						STELLITED,STEM-13%CR STEEL	NO.- 51501		
GLV	VLV.GLOBE	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2	12		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 52501	52501ZZZ0	
CHV	VLV.CHECK	.25	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	2	24		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-STELLITED	FLGD, 600, B-16.5, RF/125AARH, SHT NO.- 53501	53501ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 600	GK66276Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2	12	M	EIL'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE	SP13344Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F22A** Sheet 1 of 4

PIPE CLASS : **F22A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427
PRESS	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE

STEAM, CONDENSATE, BOILER BLOWDOWN, FEEDWATER DISCHARGE AND CHEMICAL FEED TO BOILER ((AS PER ASME SEC-I)

NOTES

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

9 CARBON CONTENT SHALL NOT EXCEED 0.25% FOR ALL PIPES,FITTINGS FLANGES ETC. THAT MAY REQUIRE WELDING. MOREOVER,FOR FLANGES THE SULPHUR AND PHOSPHOROUS SHALL ALSO BE LIMITED TO 0.05% EACH.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

90 INST. CONNECTIONS LIKE ORIFICE TAPS ETC SHALL BE PROVIDED WITH DOUBLE ISOLATION VALVES.

108 PIPING WITH THICKNESS>12.7MM SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3(EDITION 2012).

122 FOR INSTRUMENTATION USE ONLY.

131 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [170 DEG. C & 207 KG/ CM2 G].

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

253 UPON PROLONGED EXPOSURE TO TEMPERATURE ABOVE 412 DEG C,THE CARBIDE PHASE OF CARBON STEEL MAY BE CONVERTED TO GRAPHITE. VALUES INDICATED IN PRESSURE/TEMPERATURE CHART AT 427 DEG C ARE PER ASME B 31.1, TABLE A-1 AND MAY BE USED WITH EXTREME CAUTION ON A CASE TO CASE BASIS, BUT IN NO CASE EXCEED IT.

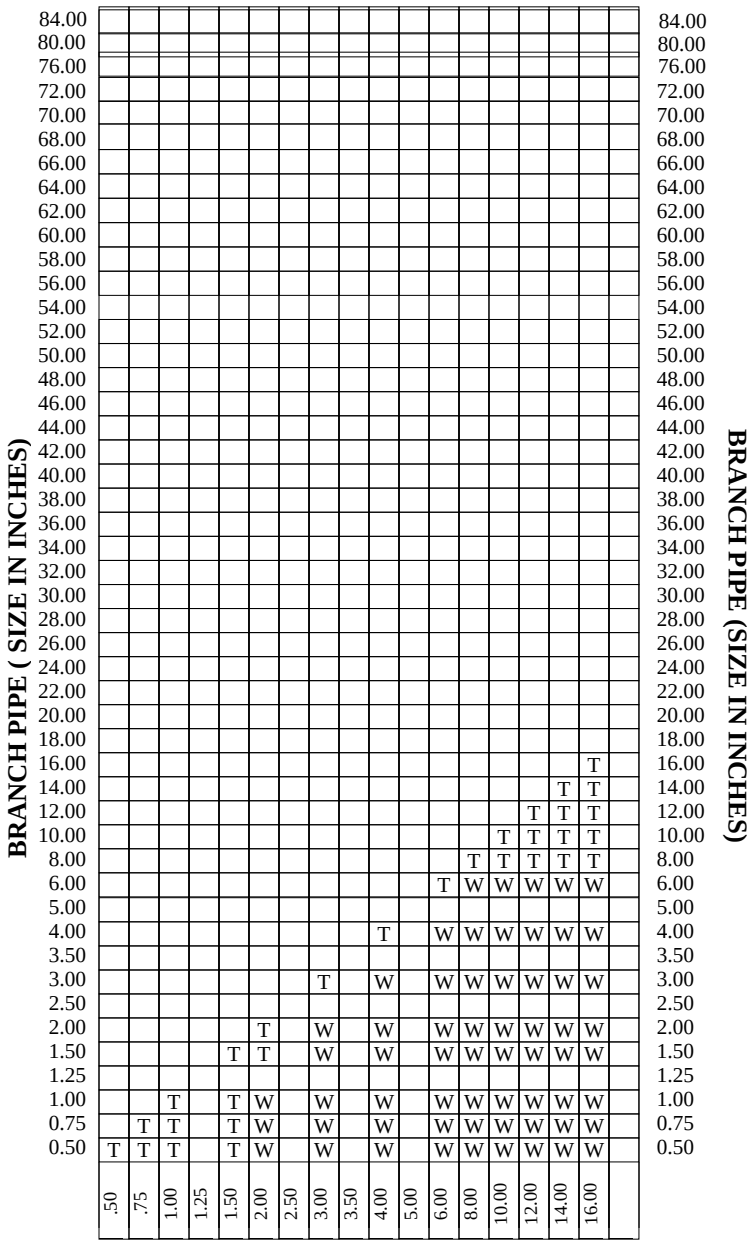
279 ALL THE PIPING COMPONENTS SHALL BE AS PER ASME SEC-I/ASME B 31.1

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER JOB STD A545-7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE GLOBE VALVES (OR AS PER P&ID)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F22A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F22A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F22A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	S160	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	
PIP	PIPE	1.5	1.5	S160	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	32
PIP	PIPE	2	2	S160	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	
PIP	PIPE	3	4	XXS	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	
PIP	PIPE	6	6	S160	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	131
PIP	PIPE	8	8	XXS	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	131
PIP	PIPE	10	16	S160	B-36.10	SA-106/SA-106M GR.B	BE, SEAMLESS	PI2T617Z1	131
NIP	NIPPLE	.5	1.5	M	B-36.10	SA-106/SA-106M GR.B	PBE, SEAMLESS	PN2T667Z1	
Flange Group									
FLG	FLNG.WN	.5	16	M	B-16.5	SA-105/SA-105M	1500, RTJ/63AARH	FWCH189Z1	
FLB	FLNG.BLIND	.5	16		B-16.5	SA-105/SA-105M	1500, RTJ/63AARH	FBCH189Z1	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	SA-105/SA-105M	1500, RTJ/63AARH	FGKH189Z1	
FEF	SPCR&BLND	6	16		ASME-B16.48	SA-105/SA-105M	1500, RTJ/63AARH	FCKH189Z1	
Fitting Group									
ELB90	ELBOW.90	.5	16	M	B-16.9	SA-234/SA-234M GR.WPB	BW, 1.5D	WAGAM4Z11	
ELB45	ELBOW.45	.5	16	M	B-16.9	SA-234/SA-234M GR.WPB	BW, 1.5D	WBGAM4Z11	
TEQ	T.EQUAL	.5	16	M	B-16.9	SA-234/SA-234M GR.WPB	BW	WEGAM4ZZ1	
TRED	T.RED	.5	16	M, M	B-16.9	SA-234/SA-234M GR.WPB	BW	WRGAM4ZZ1	
REDC	REDUC.CONC	.5	16	M, M	B-16.9	SA-234/SA-234M GR.WPB	BW	WUGAM4ZZ1	
REDE	REDUC.ECC	.5	16	M, M	B-16.9	SA-234/SA-234M GR.WPB	BW	WVGAM4ZZ1	
CAP	CAP	.5	16	M	B-16.9	SA-234/SA-234M GR.WPB	BW	WFGAM4ZZ1	
O'let Group									
WLT	WELDOLET	.5	16	M, M	MSS-SP97	SA-105/SA-105M	BW	YWSAL4ZZ1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F22A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY- ASME SA 105,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 511CC	511CCZZZ1	
GAV	VLV.GATE	2	16		ANSI-B-16.34	SA-216/SA-216M GR. WCB,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 517CC	517CCZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY- ASME SA 105,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 521CC	521CCZZZ1	
GLV	VLV.GLOBE	2	16		ANSI-B-16.34	SA-216/SA-216M GR. WCB,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 527CC	527CCZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY- ASME SA 105,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 531CC	531CCZZZ1	
CHV	VLV.CHECK	2	16		ANSI-B-16.34	SA-216/SA-216M GR. WCB,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 537CC	537CCZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:SA-193/SA-193M GR.B7, NUT:SA-194/SA-194M GR.2H		BS44332Z0	
Gasket Group									
GAS	GASKET	.5	16		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 1500	GK67238Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5	M	MNF'STD	B:ASME SA105;INT:SS304	BW, Y-TYPE	SP3I145Z1	279
PSR	STRNR.PERM	2	16	M	MNF'STD	B:SA-234 GR.WPB; INT:SS304	BW, Y-TYPE	SP3H145Z1	279

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F25A** Sheet 1 of 5

PIPE CLASS : **F25A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	191
PRESS	260.5	260.5	238.7	229.9	224.6

SERVICE

CARBON MONOXIDE, REACTION KILL (BASED ON LICENSOR PMS CLASS - LGP36)

NOTES

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

720 1 INCH AND UNDER SHALL HAVE ROUND OR OVAL HANDWHEEL. USE IN INSULATED SERVICE REQUIRES EXTENDED HANDLE; SPECIFY EXTENDED HANDLE LENGTH;

725 REDUCED PORT TYPE

726 FULL PORT TYPE

728 VALVE TO BE USED FOR VENT AND DRAIN PURPOSE

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

844 FOR STRAINER SPECIFICATIONS SEE LPPF-8 INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION IX-2.
FOR SIZE RANGE - 1/2" TO 1" : STR-373 IS TO BE FOLLOWED

846 BOLTING: ASTM A 193 GR B7; GASKET: METAL BODY SEAL; 4130 STEEL STEM; SEATING: METAL; SEATING OVERLAY: HARD NICKEL ALLOY; BALL OVERLAY: HARD NICKEL ALLOY / TUNGSTEN CARBIDE; 4130 STEEL BALL; PACKING: FLEXIBLE GRAPHITE; (STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR: LEVER:

848 BUBBLE TIGHT SHUT-OFF; SEAT INSERTS: MECHANICALLY ENERGIZED;

850 BAR/FORGED; ASTM A696 GR.C OR ASTM A105; BOLTING:ASTM A193 GR B7; GASKET:METAL BODY SEAL; 4130 STEEL STEM; SEATING:METAL; SEATING OVERLAY:HARD NICKEL ALLOY; BALL OVERLAY:HARD NICKEL ALLOY/TUNGSTEN CARBIDE; 4130 STEEL BALL; PACKING:FLEXIBLE GRAPHITE;(STEM SEALS OR PACKING); OPERATOR:WEATHERPROOF GEAR

851 BUBBLE TIGHT SHUT-OFF;

855 BOLTING:ASTM A193 GR B7; SW END X NPTF; GASKET:METAL BODY SEAL; 4130 STEEL STEM & BALL; SEATING:METAL; SEATING OVERLAY:HARD NICKEL ALLOY; BALL OVERLAY: HARD NICKEL ALLOY/TUNGSTEN CARBIDE; PACKING:FLEXIBLE GRAPHITE;(STEM SEALS OR PACKING); LIVE LOADED INCONEL BELLEVILLE WASHERS; OPERATOR:LEVER

857 ASME B16.34/16.10 LONG PATTERN

943 LICENSOR PMS LGP36 SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

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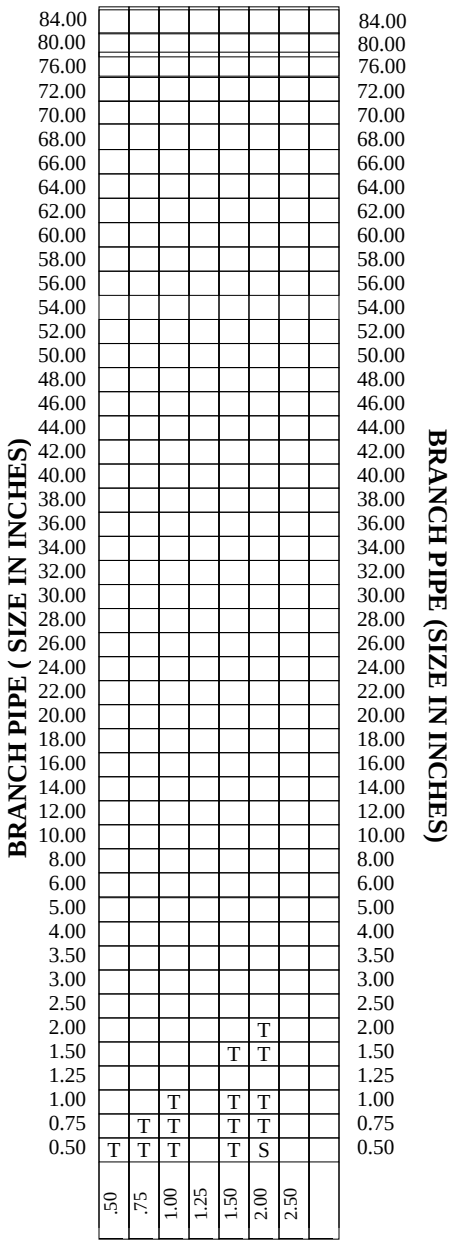
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F25A** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	NOTE-943	
	ON LINES >= 2.0"	NOTE-943	
VENTS	ON LINES <= 1.5"	NOTE-943	
	ON LINES>= 2.0"	NOTE-943	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-943)	
PRESS.CONN	0.75"	NOTE-943	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F25A** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F25A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F25A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.SW	.75	1.5	M	B-16.5	ASTM A 105	1500, RF/125AARH	FSC0187Z0	
FLG	FLNG.WN	.5	.5	M	B-16.5	ASTM A 105	1500, RF/125AARH	FWC0187Z0	
FLG	FLNG.WN	2	2	M	B-16.5	ASTM A 105	1500, RF/125AARH	FWC0187Z0	
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	1500, RF/125AARH	FBC0187Z0	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	1500, RF/125AARH	FGK0187Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.75	.75		B-16.11	ASTM A 105	SCRM	WH6029ZZ0	307
CPLF	CPLNG.FULL	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLH	CPLNG.HALF	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLL	CPLNG.LH	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F25A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
O'let Group									
SLT	SOCKOLET	.5	1.5		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	
Valves Group									
BLV	VLV.BALL	.5	1.5		ANSI-B-16.34	BODY-ASTM A 105,STEM-4130 STEEL	SW, 1500, 6000, B-16.11, SHT NO.- 541RC	541RCZZZ0	846,725, 720,848, 742
BLV	VLV.BALL	2	2		ANSI-B-16.34	BODY-ASTM A 105,STEM-4130 STEEL	FLGD, 1500, B-16.5, RF/125AARH, SHT NO.- 541RD	541RDZZZ0	850,725, 851,857, 742
BLV/1	VLV.BALL	.5	.5		ANSI-B-16.34	BODY-ASTM A 105,STEM-4130 STEEL	SPCL, 1500, 6000, B-16.11, REFER VMS SHT, SHT NO.- 541QD	541QDZZZ0	855,726, 720,848, 728
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z0	988
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SP.WND SS316L+GRAFIL+ I RING	SPIRAL, 1500	GK66378Z0	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F29K** Sheet 1 of 3

PIPE CLASS : **F29K**
RATING : 600
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-46	38	93	135
PRESS	175.8	175.8	175.8	175.8

SERVICE

CHEMICALS (BASED ON LICENSOR PMS CLASS - LC51)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

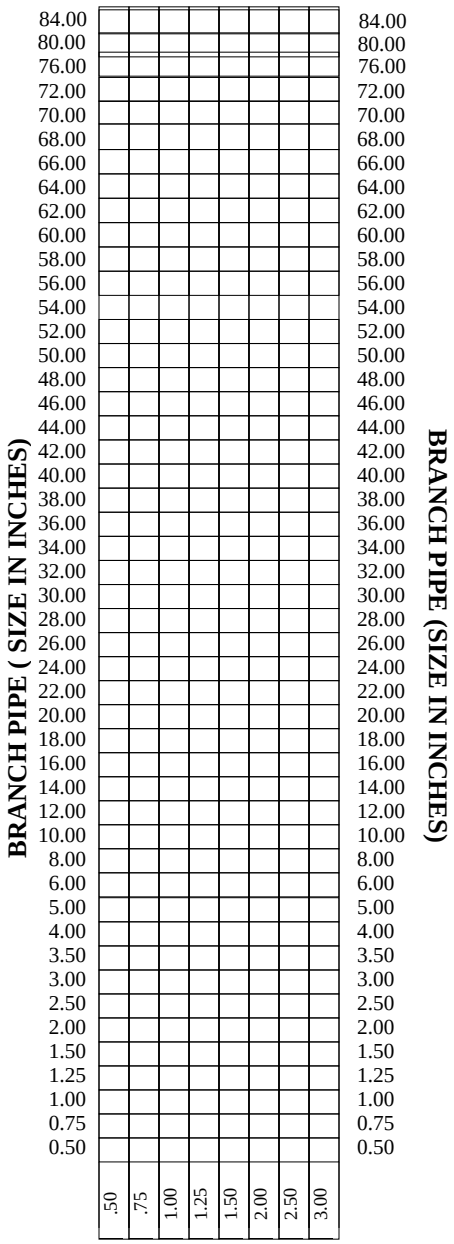
953 FOR THIS SPEC, REFER LICENSOR CLASS LC51

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F29K** Sheet 2 of 3



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F29K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F29K** Sheet 3 of 3

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2A** Sheet 1 of 4

PIPE CLASS : **F2A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427
PRESS	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE

STEAM AND BOILER FEED WATER (IBR), CONDENSATE (IBR)

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

9 CARBON CONTENT SHALL NOT EXCEED 0.25% FOR ALL PIPES,FITTINGS FLANGES ETC. THAT MAY REQUIRE WELDING. MOREOVER,FOR FLANGES THE SULPHUR AND PHOSPHOROUS SHALL ALSO BE LIMITED TO 0.05% EACH.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

90 INST. CONNECTIONS LIKE ORIFICE TAPS ETC SHALL BE PROVIDED WITH DOUBLE ISOLATION VALVES.

131 PIPE WALL THICKNESS IS CALCULATED BASED ON ACTUAL LINE DESIGN CONDITION [170 DEG. C & 207 KG/ CM2 G].

145 Y-TYPE GLOBE VALVE.

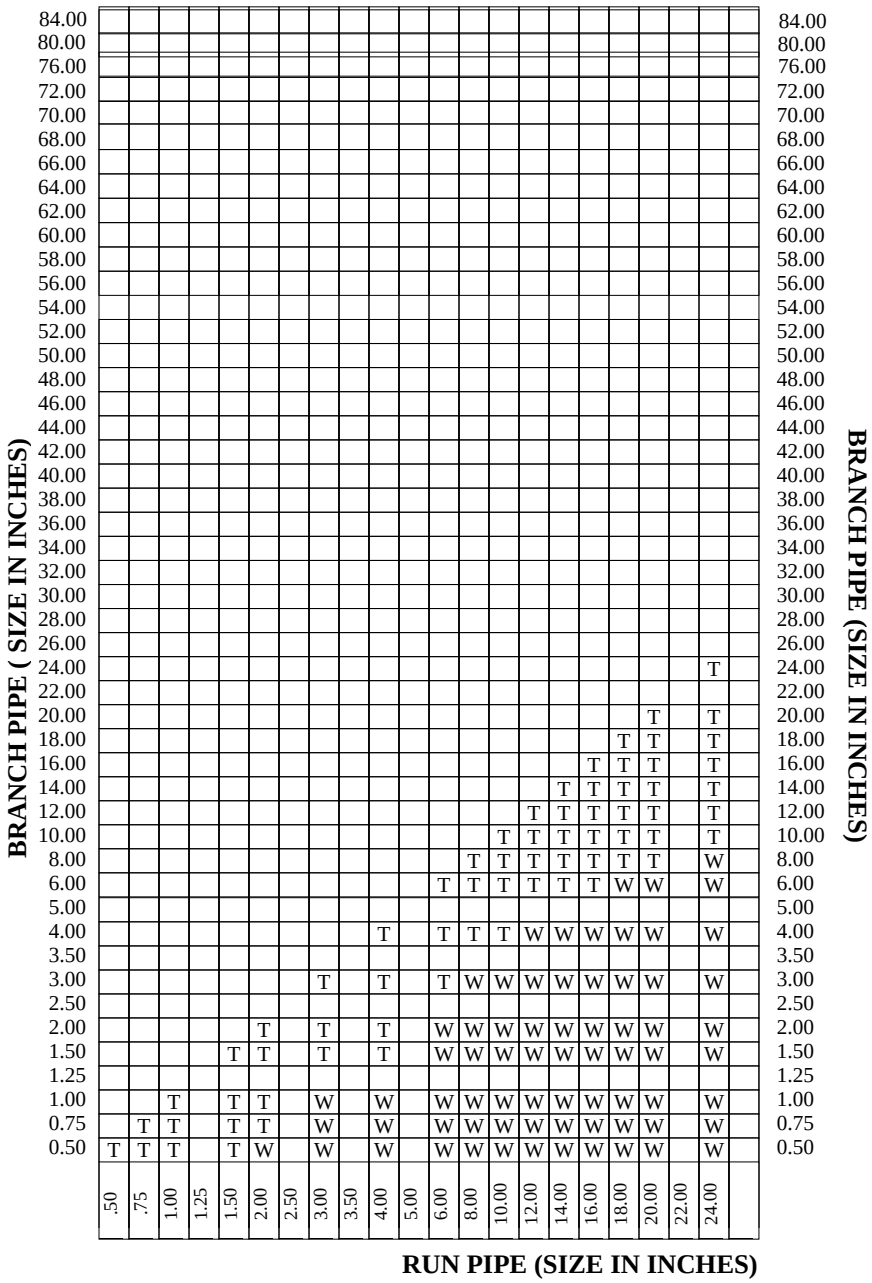
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE VALVES (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	4	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	26
PIP	PIPE	6	6	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	131
PIP	PIPE	8	8	S140	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	131
PIP	PIPE	10	10	XXS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	131
PIP	PIPE	12	14	S140	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z1	131
PIP	PIPE	16	16	S140	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z1	3,131
PIP	PIPE	18	18	42.0	B-36.10	ASTM A 672 GR.B60 CL.22	BE, E.FS.W	PI2A913Z1	3,131
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z1	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	1500, RTJ/63AARH	FWC0189Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	1500, RTJ/63AARH	FBC0189Z1	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FGK0189Z1	
FEF	SPCR&BLND	6	24		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FCK0189Z1	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z11	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z11	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z11	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z11	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ1	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ1	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ1	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ1	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ1	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ1	

Package : IPMCS
Report No. : 50

F2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ1	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ1	
CAP	CAP	.5	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ1	
O'let Group									
WLT	WELDOLET	.5	20	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	BW, 1500, B-16.25, SHT NO.- 51102	51102ZZZ1	
GAV	VLV.GATE	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED,STEM-13%CR STEEL	BW, 1500, B-16.25, SHT NO.- 51702	51702ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	BW, 1500, B-16.25, SHT NO.- 52102	52102ZZZ1	145
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED,STEM-13%CR.STEEL	BW, 1500, B-16.25, SHT NO.- 52702	52702ZZZ1	145
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53102	53102ZZZ1	
CHV	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53702	53702ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 1500	GK67238Z0	
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5	M	MNF'STD	B:A105;INT:SS304	BW, Y-TYPE	SP30345Z1	
PSR	STRNR.PERM	2	24	M	MNF'STD	B:A216GR.WCB;INT:SS304	BW, Y-TYPE	SP38045Z1	

Package : IPMCS
Report No. : 50

F2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2G** Sheet 1 of 5

PIPE CLASS : **F2G**
RATING : 1500
BASE MATERIAL : 9CR-1MO-V
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	263.65	263.65	263.65	255.91	248.18	233.77	212.67	206.7	199.67	187.01	178.57	171.19	157.83	135.69
	538	540												
	127.95	127.84												

SERVICE

VERY HIGH PRESSURE STEAM (IBR)

NOTES

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

30 ALL COMPONENTS SHALL HAVE A MINIMUM HARDNESS OF 190-250 BHN. MINIMUM HARDNESS OF ALL WELDS, INCLUDING FIELD WELDS AFTER HEAT TREATMENT SHALL BE 190-250 BHN.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

85 ALL WELDED FITTINGS SHALL BE NORMALIZED AND TEMPERED.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

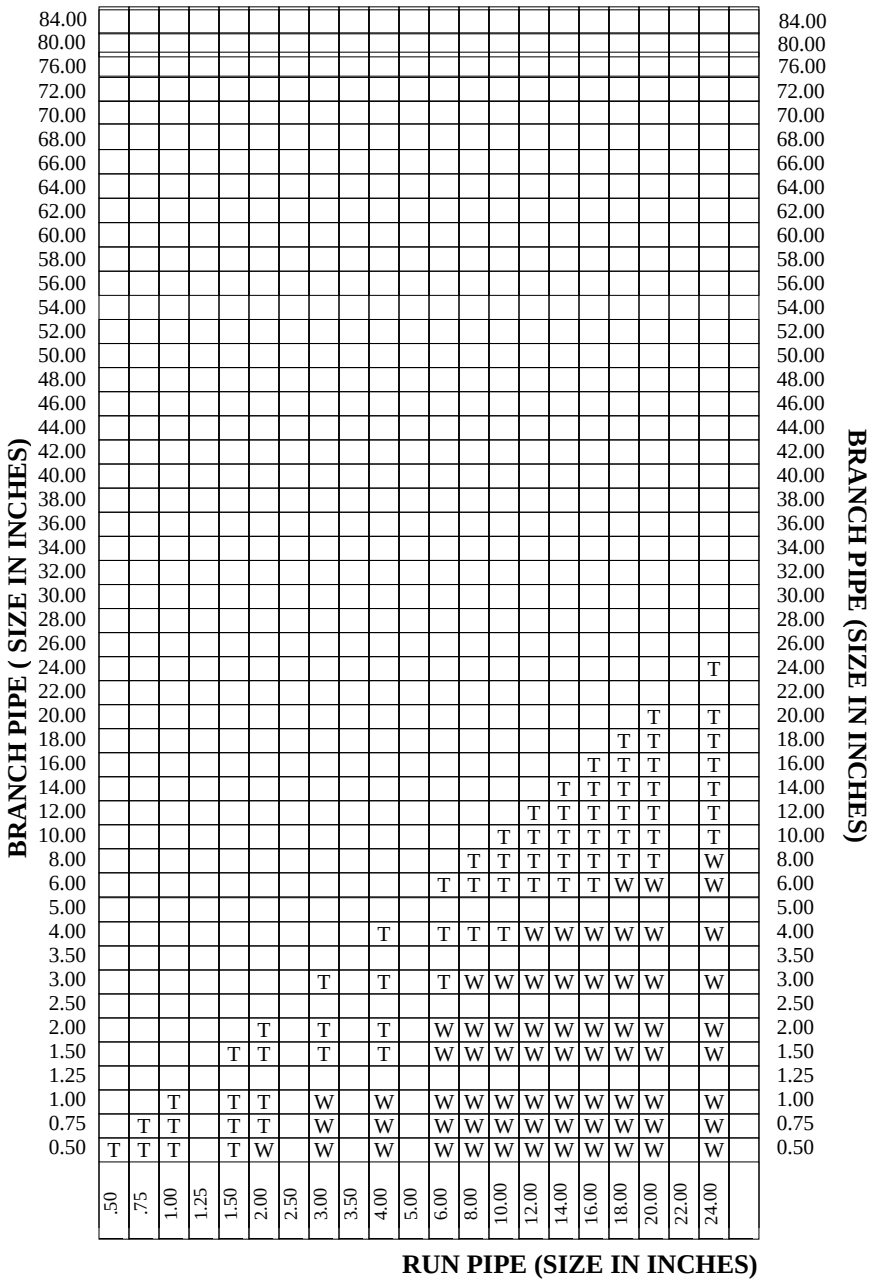
154 THICKNESS CALCULATION IS BASED ON DESIGN CONDITION 118 KG/CM2 AT 540 DEG.C

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE VALVES (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2G** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F2G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2G** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	1	1	XS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	1.5	1.5	XS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	32
PIP	PIPE	2	3	S160	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	4	4	S120	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	6	6	XS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	154
PIP	PIPE	8	8	XS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	32,154
PIP	PIPE	10	14	S100	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	154
PIP	PIPE	16	24	S100	B-36.10	ASTM A 691 GR.P91 CL.42	BE, E.FS.W	PI2L813Z1	154
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 335 GR.P91	PBE, SEAMLESS	PN2K567Z1	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F91	1500, RTJ/63AARH	FWCB789Z1	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F91	1500, RTJ/63AARH	FBCB789Z1	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F91	1500, RTJ/63AARH	FGKB789Z1	
FEF	SPCR&BLND	6	24		ASME-B16.48	ASTM A 182 GR.F91	1500, RTJ/63AARH	FCKB789Z1	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WAGQ34Z11	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WAGU54Z11	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WBGQ34Z11	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WBGU54Z11	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A234GR.WP91	BW	WEGQ34ZZ1	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW	WEGU54ZZ1	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WRGQ34ZZ1	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WRGU54ZZ1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2G** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WUGQ34ZZ1	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WUGU54ZZ1	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WVGQ34ZZ1	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WVGU54ZZ1	
CAP	CAP	.5	24	M	B-16.9	ASTM A234GR.WP91	BW	WFGQ34ZZ1	
O'let Group									
WLT	WELDOLET	.5	24	M, M	MSS-SP97	ASTM A 182 GR.F91	BW	YWSQ24ZZ1	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13%CR STEEL	BW, 1500, B-16.25, SHT NO.- 51140	51140ZZZ1	
GAV	VLV.GATE	2	8		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 51740	51740ZZZ1	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13%CR STEEL	BW, 1500, B-16.25, SHT NO.- 52140	52140ZZZ1	
GLV	VLV.GLOBE	2	8		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 52740	52740ZZZ1	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F91,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53140	53140ZZZ1	
CHV	VLV.CHECK	2	8		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53740	53740ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	5%CR 0.5%Mo	OCT-RING, 1500	GK67338Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A182GR.F91;INT:SS304	BW, THRMDNMC	TR3F545Z1	

Package : IPMCS
Report No. : 50

F2G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F2G** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
PSR	STRNR.PERM	.5	1.5	M	MNF'STD	B:A182GR.F91;INT: SS304	BW, Y-TYPE	SP3F545Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36A** Sheet 1 of 5

PIPE CLASS : **F36A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	190
PRESS	196.85	196.85	196.85	196.85	196.85

SERVICE

KILL GAS (BASED ON LICENSOR PMS CLASS - 1K6)

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 20.00 MM.

90 INST. CONNECTIONS LIKE ORIFICE TAPS ETC SHALL BE PROVIDED WITH DOUBLE ISOLATION VALVES.

103 SPECIAL GLOBE VALVE/ CHECK VALVES, IF CALLED OUT IN P&ID SHALL BE USED.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

341 PIPING SHALL PASS A SENSITIVE LEAK TEST IN ACCORDANCE WITH PPM-570 PRIOR TO INITIAL OPERATION.

342 FOR ALL SOCKET WELDED BALL VALVE, ON INSTALLATION, REMOVE ALL BOLTS EXCEPT ONE AND ROTATE CENTER SECTION OF VALVE OUT OF LINE DURING SOCKET WELDING. BE CAREFUL TO AVOID DAMAGE TO OR LOSS OF PARTS.

374 ONLY USE DEPEND ON P&ID NOTE.

383 UNION TYPE COUPLING IS PREFERRED, BUT FLANGES MAY BE USED TO MATCH EQUIPMENT NOZZLE.

384 USE FOR VENT AND DRAINS WITH A CPV "O-SEAL" CAP.

385 USE CPV NEEDLE VALVE FOR INSTRUMENT CONNECTION.

390 DO NOT USE FOR HYDROGEN SERVICE.

391 USE FOR T2 INJECTION/ N2 SERVICE. DO NOT USE FOR HYDROGEN SERVICE.

392 SEAL WELD THE SCREWED END AFTER ASSEMBLY; DO NOT USE ANY THREAD DOPE. ALL EXPOSED THREADS MUST BE COVERED BY THE WELD.

620 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1K6

652 USE COUPLING & VALVE FROM " COMBINATION PUMP VALVE COMPANY" (CPV) MANUFACTURER

653 UNION TYPE COUPLING WITHVITON O-RING SEAL: CPV "O-SEAL" OR EQUIVALENT, TO BE USED FOR FULL COUPLING AND REDUCING COUPLING

654 CPV ¿O-SEAL¿ CARBON STEEL TAIL PIECES, CARBON STEEL UNION NUTS AND O-RINGS SHALL BE PURCHASED WITH EACH VALVE.

655 SPECIFY THE O-RING MATERIAL WHEN PURCHASING CPV MANUFACTURING, INC. COMPONENTS. BUNA-N MATERIAL TO BE IN ACCORDANCE WITH MILITARY SPECIFICATION MIL-P-25732 SUITABLE FOR USE FROM -40°C (-40°F) TO 135°C (275°F).

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36A** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	2.0" & BELOW	CPV O-SEAL SYSTEM, FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	2.0" & BELOW	SOCKET OR BUTT-WELDED WITH SPECIAL O-RING UNIONS. BACKING RINGS SHALL NOT BE USED FOR WELDED JOINTS.	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVES AND FITTINGS	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVES AND FITTINGS	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVES AND FITTINGS	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVES AND FITTINGS	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH CPV VALVES AND FITTINGS	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36A** Sheet 3 of 5

BRANCH PIPE (SIZE IN INCHES)

	.50	.75	1.00	1.25	1.50	2.00	2.50	
84.00								84.00
80.00								80.00
76.00								76.00
72.00								72.00
70.00								70.00
68.00								68.00
66.00								66.00
64.00								64.00
62.00								62.00
60.00								60.00
58.00								58.00
56.00								56.00
54.00								54.00
52.00								52.00
50.00								50.00
48.00								48.00
46.00								46.00
44.00								44.00
42.00								42.00
40.00								40.00
38.00								38.00
36.00								36.00
34.00								34.00
32.00								32.00
30.00								30.00
28.00								28.00
26.00								26.00
24.00								24.00
22.00								22.00
20.00								20.00
18.00								18.00
16.00								16.00
14.00								14.00
12.00								12.00
10.00								10.00
8.00								8.00
6.00								6.00
5.00								5.00
4.00								4.00
3.50								3.50
3.00								3.00
2.50								2.50
2.00						T		2.00
1.50					T	T		1.50
1.25								1.25
1.00			T		T	T		1.00
0.75		T	T		T	T		0.75
0.50	T	T	T		T	S		0.50

BRANCH PIPE (SIZE IN INCHES)

RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F36A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2	2	S160	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
Flange Group									
FLG	FLNG.WN	.5	2	M	B-16.5	ASTM A 105	1500, RTJ/63AARH	FWC0189Z0	383
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 105	1500, RTJ/63AARH	FBC0189Z0	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FGK0189Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB45	ELBOW.45	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
TEQ	T.EQUAL	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TRED	T.RED	.5	1.5		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	2	2	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2	2	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
PLG	PLUG	.5	1.5		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	1.5		MNF'STD	ASTM A 105	SW, 6000	WJN02D3Z0	653
CPLH	CPLNG.HALF	.5	1.5		MNF'STD	ASTM A 105	SW, 6000	WKN02D3Z0	653
CPLL	CPLNG.LH	.5	1.5		MNF'STD	ASTM A 105	SW, 6000	WLN02D3Z0	653
CPLR	CPLNG.RED	.5	1.5		MNF'STD	ASTM A 105	SW, 6000	WMN02D3Z0	653
UNN	UNION	.5	2		MNF'STD	ASTM A 105	SW, 6000	WQN02D3Z0	653

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
SLT	SOCKOLET	.5	1.5		MSS-SP97	ASTM A 105	SW, 6000	YSS02D3Z0	
ELT	ELBOWLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 6000	YES02D3Z0	311
ELT	ELBOWLET	2	2	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
LLT	LATROLET	1.5	1.5		MSS-SP97	ASTM A 105	SW, 6000	YLS02D3Z0	311
LLT	LATROLET	2	2	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
GAV	VLV.GATE	.5	2		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 1500, 6000, B-16.11, SHT NO.-511MB	511MBZZZ0	620
GLV/1	VLV.GLOBE	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),BODY SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-522MB	522MBZZZ0	620
CHV	VLV.CHECK	.5	.75		MNF'STD	BODY-ASTM A 105 / A 216GR.WCB,SEAT-SS316	SW, 800, 3000, B-16.11, SHT NO.-530MA	530MAZZZ0	620
CHV	VLV.CHECK	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B150),SEAT-304+BUNA-N	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-532MB	532MBZZZ0	620
BLV	VLV.BALL	.5	2		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB,BALL +STEM-SS316 ; SEATS-RPTFE	SW, 1500, 6000, B-16.11, SHT NO.-541WD	541WDZZZ0	620
BLV/3	VLV.BALL	.5	1		API-6D	BODY-ASTM A 105,BALL-13%CR STEEL;STEEL-CR2C3	SCRF, 1500, 6000, B-1.20.1, SHT NO.-541MB	541MBZZZ0	620
BLV/2	VLV.BALL	.5	1		API-6D	BODY-ASTM A 105,BALL-13%CR STEEL; SEAT-CR2C3	SPCL, 1500, 6000, MNF'STD, REFER VMS SHT, SHT NO.-541NC	541NCZZZ0	620
BLV/1	VLV.BALL	.5	.75		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,TRIM-SS 316 SEAT : RPTFE	SW, 800, 3000, B-16.11, SHT NO.-540MB	540MBZZZ0	620
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 1500	GK67238Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36K** Sheet 1 of 5

PIPE CLASS : **F36K**
RATING : 1500
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-40	38	93	135
PRESS	241.1	241.1	217.6	201.78

SERVICE

MODIFIER C (BASED ON LICENSOR PMS CLASS - 7K6)

NOTES

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

382 UNION TYPE COUPLING WITH BUNA-N O-RING SEAL: CPV "O-SEAL" OR EQUIVALENT, TO BE USED FOR FULL COUPLING AND REDUCING COUPLING. ENDS TO BE SOCKET WELDING FOR SIZES 0.5" TO 1" AND BUTT WELDING FOR SIZES 1.5" TO 2".

383 UNION TYPE COUPLING IS PREFERRED, BUT FLANGES MAY BE USED TO MATCH EQUIPMENT NOZZLE.

384 USE FOR VENT AND DRAINS WITH A CPV "O-SEAL" CAP.

385 USE CPV NEEDLE VALVE FOR INSTRUMENT CONNECTION.

410 VALVE SHALL BE PURCHASED WITH SW TAIL PIECES & UNION NUTS AND O-RING.

412 USE VALVE FROM " COMBINATION PUMP VALVE COMPANY" (CPV) MANUFACTURER.

528 DUAL STAMP SHALL BE REQUIRED FOR ALL MATERIALS WHERE 2 GRADES OF MATERIAL ARE REQUIRED.

630 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 7K6

655 SPECIFY THE O-RING MATERIAL WHEN PURCHASING CPV MANUFACTURING, INC. COMPONENTS. BUNA-N MATERIAL TO BE IN ACCORDANCE WITH MILITARY SPECIFICATION MIL-P-25732 SUITABLE FOR USE FROM -40°C (-40°F) TO 135°C (275°F).

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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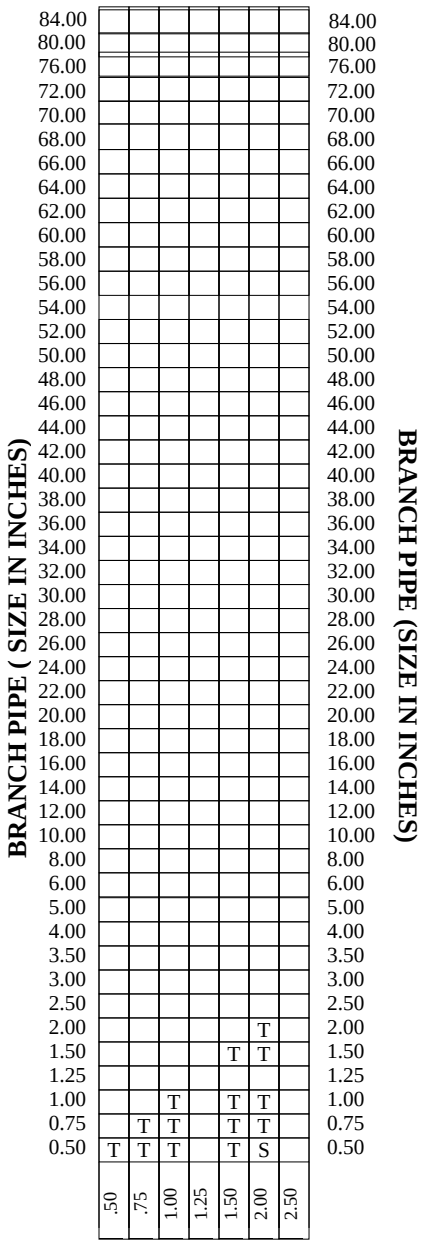
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36K** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINANCE JOINTS	2.0" & BELOW	CPV O-SEAL SYSTEM, FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SOCKET WELDED WITH SPECIAL UNION TYPE FIELD ASSEMBLED JOINTS	
	1.5" TO 2"	BUTT WELDED WITH SPECIAL UNION TYPE FIELD ASSEMBLED JOINTS	
DRAINS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVE AND FITTINGS	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVE AND FITTINGS	
VENTS	ON LINES <=1.5"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVE AND FITTINGS	
	ON LINES >=2"	AS PER P&ID OR 0.75" WITH CPV DOUBLE VALVE AND FITTINGS	
TEMP. CONN.		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS. CONN.	0.75"	AS PER P&ID OR WITH CPV VALVES AND FITTINGS	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36K** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F36K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z0	
PIP	PIPE	1.5	1.5	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
PIP	PIPE	2	2	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z0	
NIP	NIPPLE	.5	1.5	M	B-36.19	ASTM A312 GR.TP304/304L	PBE, SEAMLESS	PN3O767Z0	
Flange Group									
FLG	FLNG.WN	.5	2	M	B-16.5	ASTM A 182 GR.F316/316L	1500, RTJ/63AARH	FWCD989Z0	383
FLB	FLNG.BLIND	.5	2		B-16.5	ASTM A 182 GR.F316/316L	1500, RTJ/63AARH	FBCD989Z0	
FEF	FLNG.FIG.8	.5	2		ASME-B16.48	ASTM A 182 GR.F316/316L	1500, RTJ/63AARH	FGKD989Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z0	
ELB90	ELBOW.90	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z10	
ELB45	ELBOW.45	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z0	
ELB45	ELBOW.45	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z10	
TEQ	T.EQUAL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z0	
TEQ	T.EQUAL	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ0	
TRED	T.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z0	
TRED	T.RED	1.5	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ0	
SWGC	SWAGE.CONC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ0	
SWGE	SWAGE.ECC	.5	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ0	
CAP	CAP	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ0	
PLG	PLUG	.5	1		B-16.11	ASTM A 182 GR.F304	SCRM, 3000	WH64292Z0	307
CPLF	CPLNG.FULL	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z0	382
CPLH	CPLNG.HALF	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z0	382
CPLL	CPLNG.LH	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z0	382

Package : IPMCS
Report No. : 50

F36K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F36K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CPLR	CPLNG.RED	.5	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z0	382
UNN	UNION	.5	2		MNF'STD	ASTM A182 GR.F304/304L	SW, 6000	WQNU6D3Z0	382
O'let Group									
SLT	SOCKOLET	.5	1		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z0	
ELT	ELBOWLET	1.5	2	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YESU64ZZ0	311
LLT	LATROLET	1.5	2	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YLSU64ZZ0	311
Valves Group									
GAV	VLV.GATE	.5	2		API 602/ ISO 15761	ASTM A182 GR. F316 / ASTM A182 GR. F316L(DUAL),TRIM-SS 316+STELLITE	SW, 1500, 6000, B-16.11, SHT NO.- 511LQ	511LQZZZ0	630
GLV/1	VLV.GLOBE	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),BODY SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.- 522LQ	522LQZZZ0	630
CHV	VLV.CHECK	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B150),SEAT-304+BUNA-N	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.- 532LQ	532LQZZZ0	630
BLV	VLV.BALL	.5	2		API-6D	BODY-ASTM A 351 GR.CF8M / ASTM A 182 GR.F316,TRIM-SS 316	SW, 1500, 6000, B-16.11, SHT NO.- 541LQ	541LQZZZ0	630
NDV/1	VLV.NEEDLE	.5	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.- 582LQ	582LQZZZ0	630
Bolt Group									
BOS	BOLT.STUD	.5	2		B-18.2	BOLT:A193 GR.B7(HDG), NUT:A194 GR.2H(HDG)		BS43927Z0	
Gasket Group									
GAS	GASKET	.5	2		B-16.20-ANSI B16.5	SS 316L	OCT-RING, 1500	GK67538Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F55K** Sheet 1 of 5

PIPE CLASS : **F55K**
RATING : 1500
BASE MATERIAL : SS 304/304L
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT : LOW TEMPERATURE SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-40	38	93	135
PRESS	210.9	210.9	177.9	164.2

SERVICE

HYDROGEN; KILL GAS (BASED ON LICENSOR PMS CLASS - L7K6D)

NOTES

11 IMPACT TESTING REQUIRED FOR ALL WELDED ITEMS. VALUES SHALL BE AS PER ASME B31.3 TABLE 323.3.5 AND ASTM A 370.

12 VALVES SHALL HAVE EXTENDED BONNET AS PER BS 6364(NON COLD BOX APPLICATION) / BS EN ISO 28921-1.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

707 PIPING ON THIS SPECIFICATION SHALL BE CLEANED OR OTHERWISE PREPARED FOR SERVICE IN ACCORDANCE WITH POD-CS-PP (INCLUDED IN THE SUPPLEMENT TO PROCESS PARTS, VOLUME 2, SECTION X).

710 TO BE USED IF IDENTIFIED IN THE PROCESS DESIGN PACKAGE

712 MANUFACTURERS SUGGESTED MAXIMUM TEMPERATURE FOR COATING IS 260 DEG C IN CASE OF BOLTS & NUTS.

731 DO NOT APPLY ANY LUBRICANTS OR ANTI-SEIZE COMPOUNDS TO FACE OF GASKETS OR FLANGE FACES.

742 ALL TERMINAL VALVES SHALL BE SUITABLY STOPPLED USING AN APPROPRIATE CLOSURE COMPONENT, I.E. PLUG, BLIND FLANGE, ETC.

832 SHUT-OFF SERVICE; 6000 PSI; SPECIAL UNION ENDS; OUTSIDE SCREW; RISING STEM; RISING HANDWHEEL; BONNET: THREADED; STEM: 316 STAINLESS STEEL GUIDE ASSEMBLY: COPPER NICKEL WITH VESPEL DISC; SEAT: MONEL; PACKING: BUNA-N; BODY O-RING: BUNA-N WITH PTFE BACK UP RING; SEAT O-RING: BUNA-N

835 VALVE; CHECK; UNIBODY; SPRING LOADED AXIALLY OPENING DISC; 6000 PSI; SPECIAL UNION ENDS; BODY: ASTM B150 ALUMINUM BRONZE; SEAT / DISC: 304 STAINLESS STEEL; SEAT O-RING: BUNA-N; DISC O-RING: BUNA-N

877 USE FLANGES ONLY AT FLANGED EQUIPMENT CONNECTIONS AND OTHER FLANGED COMPONENTS.

879 VALVE; GATE; API 602; CLASS 1500; FORGED; STAINLESS STEEL; ASTM A 182 GR F 316L; OS&Y; RISING STEM; REDUCED PORT TYPE; BONNET: WELDED; API TRIM #10; DISC: SOLID WEDGE; PACKING: FLEXIBLE GRAPHITE; OPERATOR: HANDWHEEL.

880 RECOMMENDED VENDOR IS CPV MANUFACTURING, INC.
VALVE IS TO BE PURCHASED WITH UNION NUTS, APPROPRIATE TAIL PIECES AND O-RINGS.

881 USE FOR VENTS AND DRAINS WITH A CPV- "O-SEAL" BLANK FITTING.

883 ENDS TO BE SOCKET WELDING FOR 0.75" TO 1" & BUTT WELDING FOR 1.5" TO 2"; STAINLESS STEEL; SPECIAL UNION TYPE; O-SEAL: BUNA-N; 6000 PSI O-RING FITTING AS MANUFACTURED BY CPV MANUFACTURING, INC., SEE MANUFACTURER'S CATALOG FOR FITTING DESCRIPTIONS, DIMENSIONS AND ORDERING INFORMATION.

884 SPECIFY THE BUNA-N O-RING MATERIAL WHEN PURCHASING FITTINGS. BUNA-N MATERIAL TO BE IN ACCORDANCE WITH USA MILITARY SPECIFICATION MIL-P-25731. AND SUITABLE FOR USE FROM -40 C (140 F) TO 135 C (275 F). ALL FITTINGS AND MATERIALS TO BE SUITABLE FOR PRESSURE/ TEMPERATURE RATINGS OF THIS SPECIFICATION.

904 LICENSOR PMS L7K6D SHALL GOVERN FOR ANY ADDITIONAL COMPONENTS/ VALVES SPECIFIED IN PROCESS DESIGN PACKAGE/ P&IDS, VENTS & DRAINS AND INSTRUMENT CONNECTION.

988 PTFE COATED BOLTS & NUTS SHALL NOT BE USED BEYOND TEMPERATURE 260 DEG C(500 DEG F).

991 UNION TYPE COUPLING WITH BUNA-N O-RING SEAL: CPV "O-SEAL" OR EQUIVALENT, SHALL BE CONSIDERED AS PRIMARY PREFERENCE FOR USAGE IN PLACE OF FULL COUPLING AND REDUCING COUPLING.

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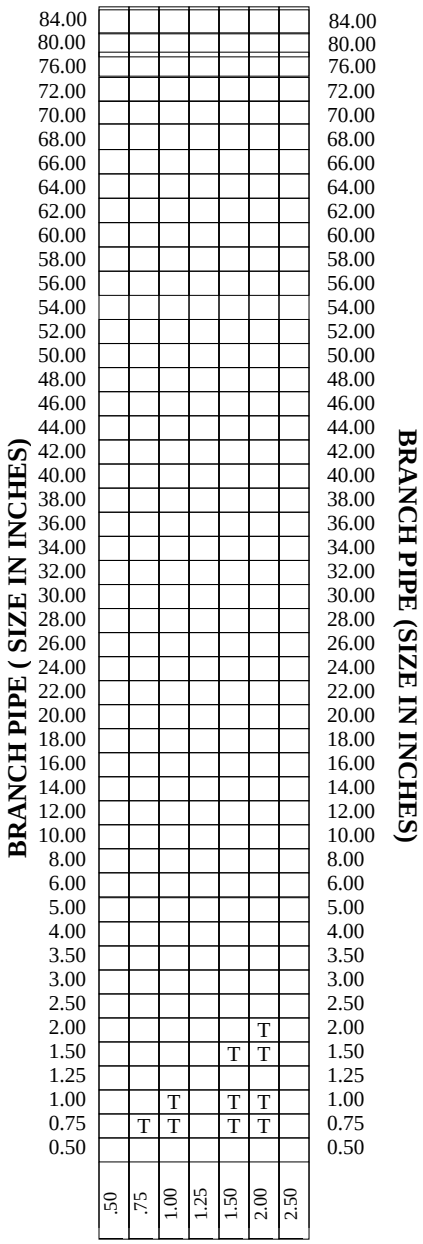
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F55K** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	CPV O-SEAL SYSTEM, FLANGED, TO BE KEPT MINIMUM (NOTE-877)	
PIPE JOINTS	2.0" & BELOW	CPV O-SEAL SYSTEM	
DRAINS	ON LINES <= 1.5"	NOTE-904	
	ON LINES >= 2.0"	NOTE-904	
VENTS	ON LINES <= 1.5"	NOTE-904	
	ON LINES >= 2.0"	NOTE-904	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. LPPF-10 (NOTE-904)	
PRESS.CONN	0.75"	NOTE-904	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F55K** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F55K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F55K** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.75	1	80S	B-36.19	ASTM A312 GR.TP304/304L	PE, SEAMLESS	PI3O777Z5	
PIP	PIPE	1.5	2	80S	B-36.19	ASTM A312 GR.TP304/304L	BE, SEAMLESS	PI3O717Z5	
Flange Group									
FLG	FLNG.SW	1	1	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	1500, RF/125AARH	FSCF787Z5	877
FLG/1500	FLNG.SW	.75	.75	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	1500, RF/125AARH	FSCF787Z5	710,877
FLG	FLNG.WN	.75	.75	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	1500, RF/125AARH	FWCF787Z5	877
FLG	FLNG.WN	1.5	2	M	B-16.5	ASTM A 182 GR.F316/316L DUAL	1500, RF/125AARH	FWCF787Z5	877
FLB	FLNG.BLIND	.75	2		B-16.5	ASTM A 182 GR.F316/316L DUAL	1500, RF/125AARH	FBCF787Z5	877
FEF	FLNG.FIG.8	.75	2		ASME-B16.48	ASTM A 182 GR.F316/316L DUAL	1500, FF/125AARH	FGKF781Z5	
Fitting Group									
ELB90	ELBOW.90	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WA6U6D2Z5	
ELB90	ELBOW.90	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WAGU74Z15	
ELB45	ELBOW.45	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WB6U6D2Z5	
ELB45	ELBOW.45	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW, 1.5D	WBGU74Z15	
TEQ	T.EQUAL	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WE6U6D2Z5	
TEQ	T.EQUAL	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WEGU74ZZ5	
TRED	T.RED	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WR6U6D2Z5	
TRED	T.RED	1.5	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WRGU74ZZ5	
REDC	REDUC.CONC	1.5	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WUGU74ZZ5	
REDE	REDUC.ECC	1.5	2	M, M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WVGU74ZZ5	
SWGC	SWAGE.CONC	.75	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WNHU66ZZ5	

Package : IPMCS
Report No. : 50

F55K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F55K** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
SWGE	SWAGE.ECC	.75	2	M, M	BS-3799	ASTM A182 GR.F304/304L	PBE	WPHU66ZZ5	
CAP	CAP	1.5	2	M	B-16.9	ASTM A403 GR.WP304/304L-S	BW	WFGU74ZZ5	
CPLF	CPLNG.FULL	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WJ6U6D2Z5	991
CPLH	CPLNG.HALF	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WK6U6D2Z5	991
CPLL	CPLNG.LH	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WL6U6D2Z5	991
CPLR	CPLNG.RED	.75	1		B-16.11	ASTM A182 GR.F304/304L	SW, 3000	WM6U6D2Z5	991
UNN	UNION	.75	2		MNF'STD	ASTM A182 GR.F304/304L	SW, 6000	WQNU6D3Z5	883,884
O'let Group									
SLT	SOCKOLET	.75	1		MSS-SP97	ASTM A182 GR.F304/304L	SW, 3000	YSSU6D2Z5	
WLT	WELDOLET	1.5	1.5	M, M	MSS-SP97	ASTM A182 GR.F304/304L	BW	YWSU64ZZ5	
Valves Group									
GAV	VLV.GATE	.75	2		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316L,TRIM-SS 316	SW, 1500, 3000, B-16.11, SHT NO.-511RM	511RMZZZ5	879,12,742
GLV	VLV.GLOBE	.75	2		MNF'STD	ALUMINIUM BRONZE (ASTM B148),STEM-SS 316,SEAT-MONEL	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-527RR	527RRZZZ5	832,12,880,881,742
CHV	VLV.CHECK	.75	2		MNF'STD	ALUMINIUM BRONZE (ASTM B150),TRIM-SS 304	SPCL, 6000, 6000, MNF'STD, REFER VMS SHT, SHT NO.-537RR	537RRZZZ5	835,12,880,742
Bolt Group									
BOS	BOLT.STUD	.75	2		B-18.2	BOLT:A193 GR.B7 (PTFE COATED), NUT:A194 GR.2H (PTFE COATED)		BS44938Z5	988
Gasket Group									
GAS	GASKET	.75	2		B-16.20-ANSI B16.5	SS316L+GRAFIL+SS316L I/O RING	SPIRAL, 1500	GK69778Z5	731

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F81A** Sheet 1 of 5

PIPE CLASS : **F81A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 0.75 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	66
PRESS	175.77	175.77	175.77

SERVICE

ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1K8)

NOTES

5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.

7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.

123 PIPING WITH THICKNESS>12.7 SHALL BE IMPACT TESTED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

302 ONLY DEPEND UPON P&ID NOTE.

307 SCREWED TYPE PLUG WITH HEXAGONAL HEAD SHALL BE USED ONLY FOR THE OUTLET SIDE OF VENT AND DRAIN VALVES.

311 USE FOR ONLY THERMOWELL CONNECTION.

312 USE FOR VENT, DRAIN AND INSTRUMENT CONNECTION.

341 PIPING SHALL PASS A SENSITIVE LEAK TEST IN ACCORDANCE WITH PPM-570 PRIOR TO INITIAL OPERATION.

345 ANY UNAVOIDABLE THREADED JOINT CONNECTIONS SHALL BE SEAL WELDED. DO NOT USE THREAD DOPE WHERE SEAL WELDING AND COVER ALL EXPOSED THREADS WITH WELD.

346 SAFEGUARD AND SUPPORT NPS 0.5" PIPING IN STRUCTURAL CHANNEL MATERIAL.

422 SCREWED CAP, USE FOR INSTRUMENTATION ONLY.

632 VALVES SHALL BE IN ACCORDANCE WITH THE VALVE DETAILS SPECIFIED IN LICENSOR PMS CLASS 1K8

896 WHEREVER THERE IS A DIFFERENCE IN PIPE THICKNESS/COMPONENT DESIGN FROM LICENSOR PMS, SAME SHALL BE RAISED TO LICENSOR/PMC FOR REVIEW

997 PMS FOR LLDPE/HDPE SWING UNIT SHALL BE READ IN CONJUCTION WITH LICENSOR PMS

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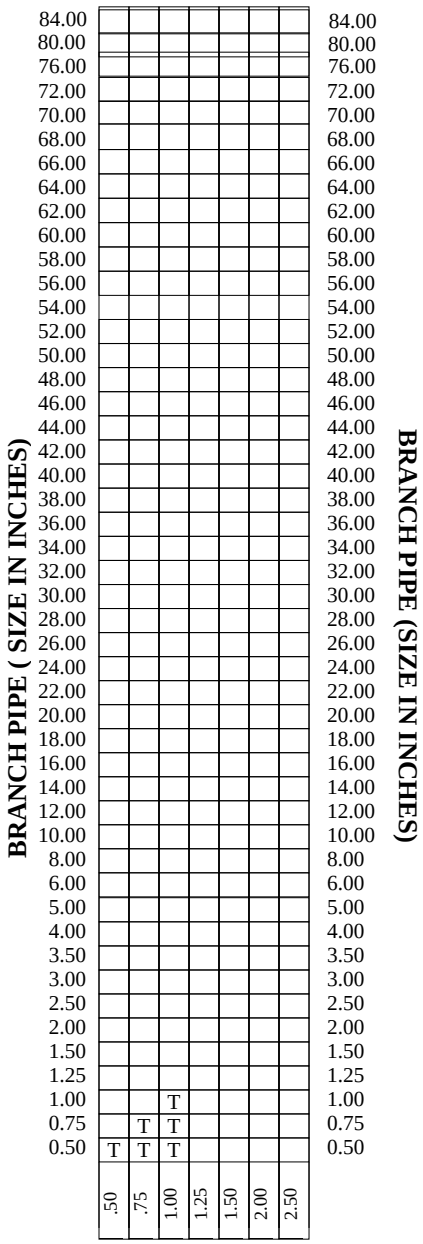
Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F81A** Sheet 2 of 5

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.0" & BELOW	SW COUPLING	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD 7-44-0350, DP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE; REFER EIL STD. 7-44-0350, VP3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75" WITH SW X SCRD BALL VALVE. REFER EIL STD 7-44-0351, V3	
TEMP.CONN		REFER LICENSOR SPECIFICATION NO. PPF-10	
PRESS.CONN	0.75"	AS PER P&ID OR WITH SW X SCRD BALL VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F81A** Sheet 3 of 5



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F81A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F81A** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
Flange Group									
FLG	FLNG.WN	.5	1	M	B-16.5	ASTM A 105	1500, RTJ/63AARH	FWC0189Z0	
FLB	FLNG.BLIND	.5	1		B-16.5	ASTM A 105	1500, RTJ/63AARH	FBC0189Z0	
FEF	FLNG.FIG.8	.5	1		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FGK0189Z0	
Fitting Group									
ELB90	ELBOW.90	.5	1		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB45	ELBOW.45	.5	1		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
TEQ	T.EQUAL	.5	1		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TRED	T.RED	.5	1		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
SWGC	SWAGE.CONC	.5	1	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	.5	1	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	.5	1		B-16.11	ASTM A 105	SCRF, 6000	WF60283Z0	422
PLG	PLUG	.5	1		B-16.11	ASTM A 105	SCRM, 3000	WH60292Z0	307
CPLF	CPLNG.FULL	.5	1		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLH	CPLNG.HALF	.5	1		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLL	CPLNG.LH	.5	1		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLR	CPLNG.RED	.5	1		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
O'let Group									
ELT	ELBOWLET	1.5	2	M, M	MSS-SP97	ASTM A 105	BW	YES024ZZ0	311
LLT	LATROLET	1.5	2	M, M	MSS-SP97	ASTM A 105	BW	YLS024ZZ0	311
Valves Group									
CHV	VLV.CHECK	.5	1		ANSI-B-16.34	BODY-ASTM A 105,TRIM-13%CR STEEL+STELLITED	SW, 1500, 6000, B-16.11, SHT NO.- 531TC	531TCZZZ0	632
BLV	VLV.BALL	.5	1		ANSI-B-16.34	BODY-ASTM A 216 GR.WCB,BALL+STEM - SS316 SEATS - NYLON	SW, 1500, 6000, B-16.11, SHT NO.- 541TD	541TDZZZ0	632

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F81A** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Valves Group									
BLV/1	VLV.BALL	.5	.75		MNF'STD	BODY-ASTM A 216 GR.WCB,BALL+STEM-SS316 SEATS-NYLON	SPCL, 1500, 6000, MNF'STD, REFER VMS SHT, SHT NO.-541TC	541TCZZZ0	312,632
Bolt Group									
BOS	BOLT.STUD	.5	1		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	1		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 1500	GK67238Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F92K** Sheet 1 of 4

PIPE CLASS : **F92K**
RATING : 1500
BASE MATERIAL : SS 304
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	93.3	149	204	260	316	343	371	399	427	454	482	510	538
PRESS	253.09	210.92	189.12	174.71	163.81	155.38	151.86	148.34	145.2	142.72	139.2	136.74	134.28	124.44

SERVICE

CORROSIVE SERVICE, PHOSPHATE SERVICE

NOTES

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

90 INST. CONNECTIONS LIKE ORIFICE TAPS ETC SHALL BE PROVIDED WITH DOUBLE ISOLATION VALVES.

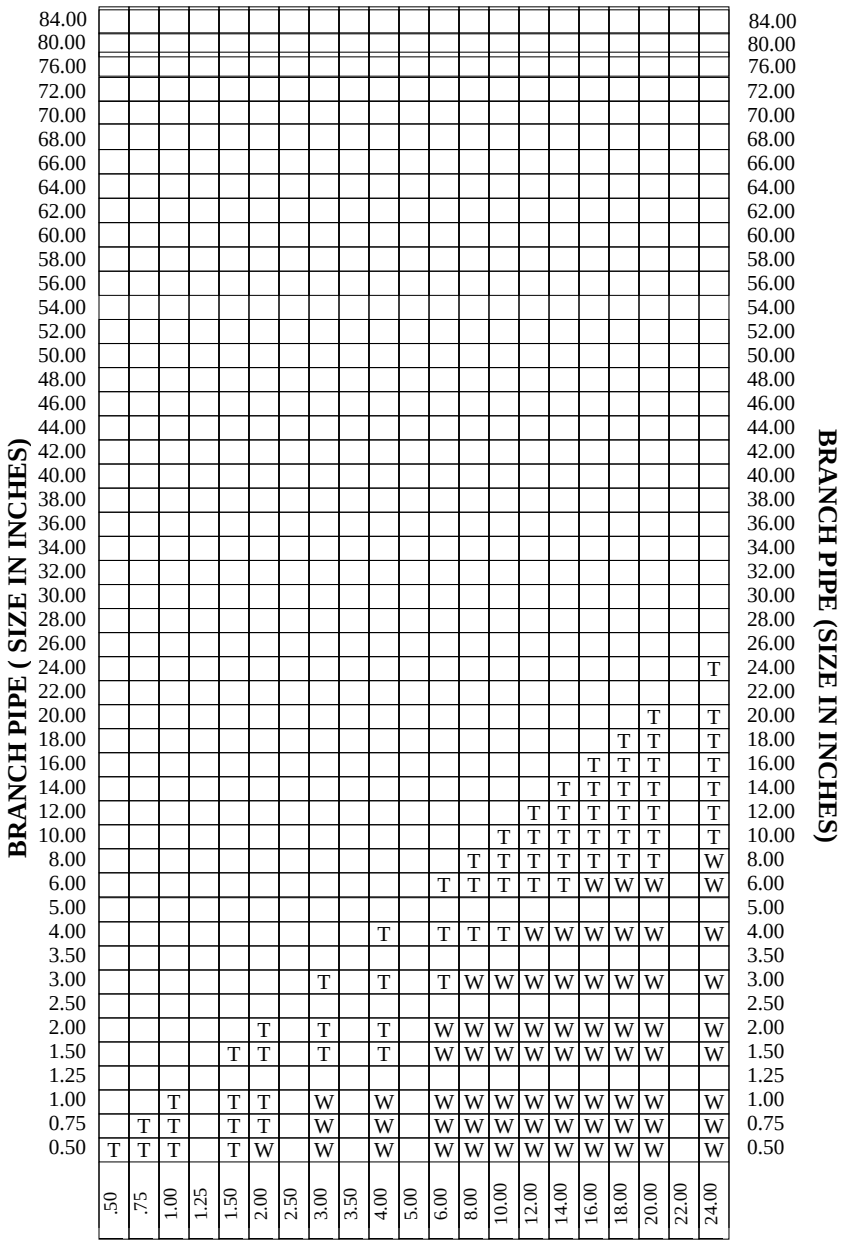
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	BUT WELDED	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PERP&IDOR0.75",TEE, NIP,DOUBLE VLV (AS PER P&ID OR LINE ISOLATION VLV),BLIND FLG ASSEMBLY (N-158)	
	ON LINES >= 2.0"	ASPERP&IDOR0.75",WELDOLET/NIP,DOUBLE VLV (AS PER P&IDORLINE ISOLATION VLV),BLIND FLG ASSEMBLY(N-158)	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75",TEE, NIPPLE, DOUBLE VLV (AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75",WELDOLET/NIP, DOUBLE VLV (AS PER P&ID OR LINE ISOLATION VLV),BLIND FLG ASSEMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353 (NOTE-150)	
PRESS.CONN	0.75"	TEE/WELDOLET&BW NIPPLE,WITH DOUBLE VLV (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES (NOTE-150)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F92K** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F92K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F92K** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1.5	S160	B-36.10	ASTM A 312 TP304	BE, SEAMLESS	PI23517Z0	
PIP	PIPE	2	2	7.6	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3	3	10.3	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	4	4	12.7	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	6	8	CALC	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	14	16	CALC	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP/	NIPPLE	.5	1.5	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 182 GR.F304	1500, RTJ/63AARH	FWC4189Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 182 GR.F304	1500, RTJ/63AARH	FBC4189Z0	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F304	1500, RTJ/63AARH	FGK4189Z0	
FEF	SPCR&BLND	6	24		ASME-B16.48	ASTM A 182 GR.F304	1500, RTJ/63AARH	FCK4189Z0	
Fitting Group									
ELB90	ELBOW.90	.5	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10	24	M	B-16.9	ASTM A 403 GR.WP304-W	BW, 1.5D	WAG884Z10	
ELB45	ELBOW.45	.5	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10	24	M	B-16.9	ASTM A 403 GR.WP304-W	BW, 1.5D	WBG884Z10	
TEQ	T.EQUAL	.5	8	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10	24	M	B-16.9	ASTM A 403 GR.WP304-W	BW	WEG884ZZ0	
TRED	T.RED	.5	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-W	BW	WRG884ZZ0	
REDC	REDUC.CONC	.5	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-W	BW	WUG884ZZ0	
REDE	REDUC.ECC	.5	8	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	

Package : **IPMCS**
Report No. : **50**

F92K

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F92K** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDE	REDUC.ECC	10	24	M, M	B-16.9	ASTM A 403 GR.WP304-W	BW	WVG884ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	.5	24	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
O'let Group									
WLT	WELDOLET	.5	24	M, M	MSS-SP97	ASTM A 182 GR.F304	BW	YWS424ZZ0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	BW, 1500, B-16.25, SHT NO.- 511CL	511CLZZZ0	
GAV	VLV.GATE	2	16		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED,STEM-SS 316	BW, 1500, B-16.25, SHT NO.- 517CL	517CLZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED,STEM-SS 316	BW, 1500, B-16.25, SHT NO.- 521CL	521CLZZZ0	
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED,STEM-SS 316	BW, 1500, B-16.25, SHT NO.- 527CL	527CLZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 182 GR.F316,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 531CL	531CLZZZ0	
CHV	VLV.CHECK	2	16		ANSI-B-16.34	BODY-ASTM A 351 GR.CF8M,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 537CL	537CLZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B8, NUT:A194 GR.2H		BS40704Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SS 316	OCT-RING, 1500	GK67438Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F9A** Sheet 1 of 4

PIPE CLASS : **F9A**
RATING : 1500
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 3 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	260.49	260.49	237.28	230.61	222.87	210.57	192.29	188.77	187.37	177.17	144.83

SERVICE

MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, HYDROCARBON, ETC.

NOTES

3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 25.00 MM.

26 SEPARATE PMS CLASS SHALL BE SELECTED FOR PIPES WITH THICKNESS > 12.7MM WHERE IMPACT TESTING IS REQUIRED BASED ON DESIGN CONDITIONS AS PER ASME B31.3

90 INST. CONNECTIONS LIKE ORIFICE TAPS ETC SHALL BE PROVIDED WITH DOUBLE ISOLATION VALVES.

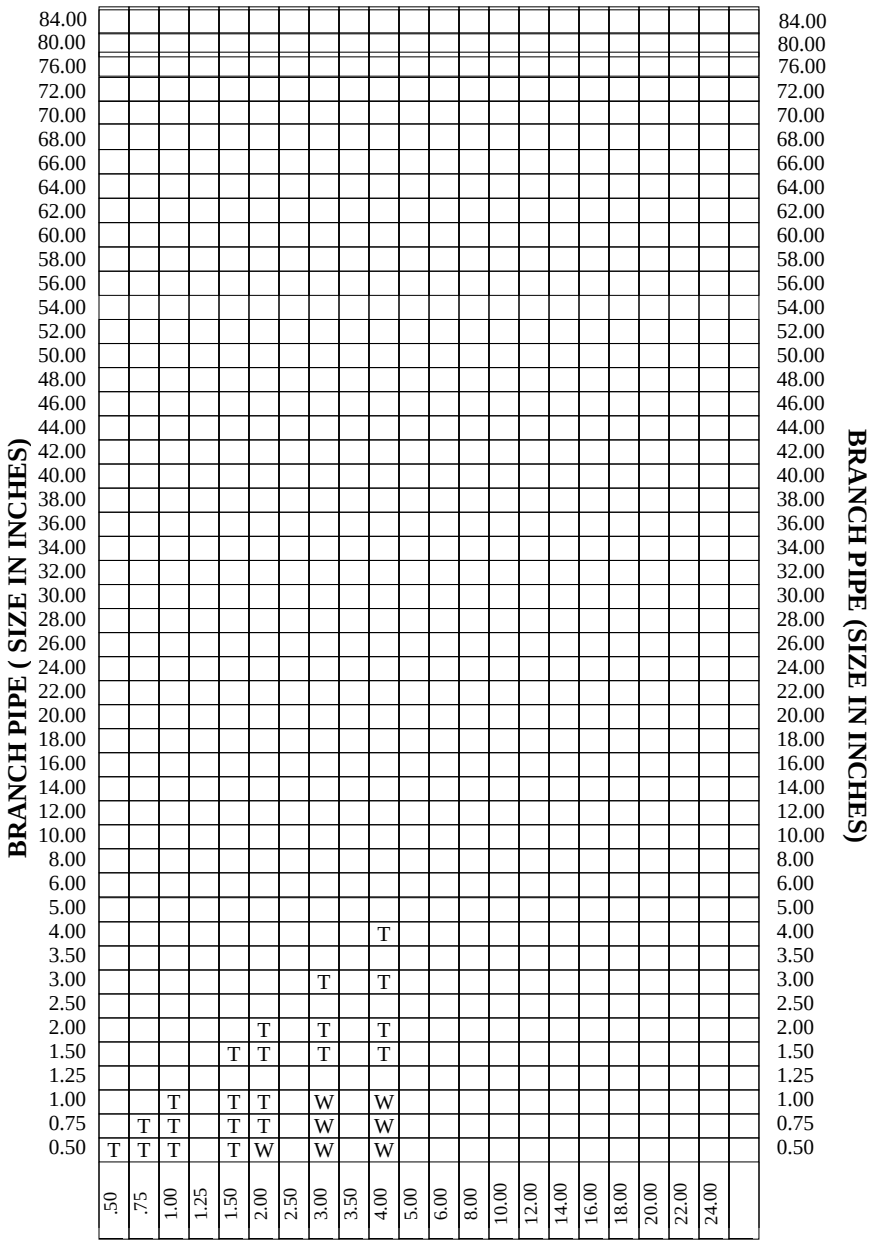
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE VALVES (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F9A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

F9A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F9A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	4	XXS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	26
PIP	PIPE	6	14	CALC	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16	24	CALC	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.FS.W	PI2A813Z0	3
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.WN	.5	24	M	B-16.5	ASTM A 105	1500, RTJ/63AARH	FWC0189Z0	
FLB	FLNG.BLIND	.5	24		B-16.5	ASTM A 105	1500, RTJ/63AARH	FBC0189Z0	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FGK0189Z0	
FEF	SPCR&BLND	6	24		ASME-B16.48	ASTM A 105	1500, RTJ/63AARH	FCK0189Z0	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
CAP	CAP	.5	24	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :F9A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
O'let Group									
WLT	WELDOLET	.5	20	M, M	MSS-SP97	ASTM A 105	BW	YWS024ZZ0	
Valves Group									
GAV	VLV.GATE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 51105	51105ZZZ0	
GAV	VLV.GATE	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 51705	51705ZZZ0	
GLV	VLV.GLOBE	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 52105	52105ZZZ0	
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 1500, B-16.25, SHT NO.- 52705	52705ZZZ0	
CHV	VLV.CHECK	.5	1.5		API 602/ ISO 15761	BODY-ASTM A 105,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53105	53105ZZZ0	
CHV	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 105 / A 216GR.WCB,TRIM-STELLITED	BW, 1500, B-16.25, SHT NO.- 53705	53705ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	24		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
Gasket Group									
GAS	GASKET	.5	24		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 1500	GK67238Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G22G** Sheet 1 of 5

PIPE CLASS : **G22G**
RATING : 2500
BASE MATERIAL : 9CR-1MO-V
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	439.4	439.4	439.4	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38
	538	540												
	213.02	212.87												

SERVICE

SUPER HIGH PRESSURE STEAM (IBR) & ASME SEC-I

NOTES

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

30 ALL COMPONENTS SHALL HAVE A MINIMUM HARDNESS OF 190-250 BHN. MINIMUM HARDNESS OF ALL WELDS, INCLUDING FIELD WELDS AFTER HEAT TREATMENT SHALL BE 190-250 BHN.

85 ALL WELDED FITTINGS SHALL BE NORMALIZED AND TEMPERED.

136 PIPE THICKNESS HAS BEEN CALCULATED BASED ON ACTUAL LINE CONDITION [128.7 KG/CM2 @ 540 DEG.C]

137 THICKNESS SPECIFIED IS ON HOLD.

145 Y-TYPE GLOBE VALVE.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

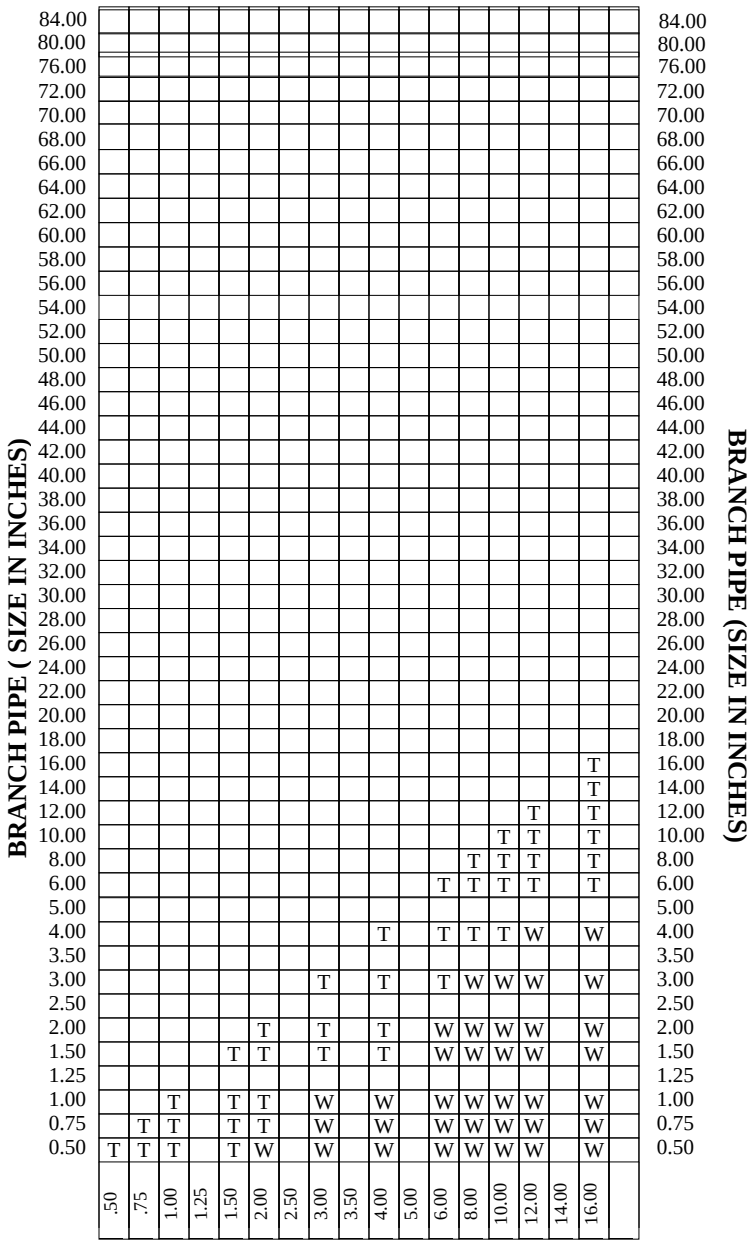
279 ALL THE PIPING COMPONENTS SHALL BE AS PER ASME SEC-I/ASME B 31.1

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE VALVES (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G22G** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

G22G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G22G** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	S160	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	137
PIP	PIPE	1.5	1.5	XXS	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	137
PIP	PIPE	2	2	XXS	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	137
PIP	PIPE	3	4	XXS	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	137
PIP	PIPE	6	6	12.7	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	136,137
PIP	PIPE	8	12	S100	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	136,137
PIP	PIPE	16	16	S100	B-36.10	SA-335/SA-335M GR.P91	BE, SEAMLESS	PI2AE17Z1	136,137
NIP/	NIPPLE	.5	1.5	M	B-36.10	SA-335/SA-335M GR.P91	PBE, SEAMLESS	PN2AE67Z1	
Flange Group									
FLG	FLNG.WN	.5	12	M	B-16.5	ASTM A 182 GR.F91	2500, RTJ/63AARH	FWCB799Z1	
FLG	FLNG.WN	14	24	M	EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FWEB799Z1	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 182 GR.F91	2500, RTJ/63AARH	FBCB799Z1	
FLB	FLNG.BLIND	14	24		EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FBEB799Z1	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F91	2500, RTJ/63AARH	FGKB799Z1	
FEF	SPCR&BLND	6	12		ASME-B16.48	ASTM A 182 GR.F91	2500, RTJ/63AARH	FCKB799Z1	
FEF	SPCR&BLND	14	24		EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FCEB799Z1	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WAGQ34Z11	
ELB90	ELBOW.90	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WAGU54Z11	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WBGQ34Z11	
ELB45	ELBOW.45	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WBGU54Z11	
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A234GR.WP91	BW	WEGQ34ZZ1	
TEQ	T.EQUAL	16	24	M	B-16.9	ASTM A234GR.WP91-W	BW	WEGU54ZZ1	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WRGQ34ZZ1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G22G** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WRGU54ZZ1	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WUGQ34ZZ1	
REDC	REDUC.CONC	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WUGU54ZZ1	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WVGQ34ZZ1	
REDE	REDUC.ECC	16	24	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WVGU54ZZ1	
CAP	CAP	.5	24	M	B-16.9	ASTM A234GR.WP91	BW	WFGQ34ZZ1	
O'let Group									
WLT	WELDOLET	.5	24	M, M	MSS-SP97	ASTM A 182 GR.F91	BW	YWSQ24ZZ1	
Valves Group									
GAV	VLV.GATE	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 512AG	512AGZZZ1	
GAV	VLV.GATE	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 518AG	518AGZZZ1	
GLV	VLV.GLOBE	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 522AG	522AGZZZ1	145
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 528AG	528AGZZZ1	145
CHV	VLV.CHECK	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED	BW, 2500, B-16.25, SHT NO.- 532AG	532AGZZZ1	
CHV	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED	BW, 2500, B-16.25, SHT NO.- 538AG	538AGZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
BOS	BOLT.STUD	14	24		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G22G** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Gasket Group									
GAS	GASKET	.5	12		B-16.20-ANSI B16.5	5%CR 0.5%Mo	OCT-RING, 2500	GK67339Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A182GR.F91;INT:SS304	BW, THRMDNMC	TR3F545Z1	
PSR	STRNR.PERM	.5	1.5	M	MNF'STD	B:A182GR.F91;INT:SS304	BW, Y-TYPE	SP3F545Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G2G** Sheet 1 of 5

PIPE CLASS : **G2G**
RATING : 2500
BASE MATERIAL : 9CR-1MO-V
CORROSION ALLOWANCE : 1.5 MM
SPECIAL REQUIREMENT : IBR SERVICE

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	93	149	204	260	316	343	371	399	427	454	482	510
PRESS	439.4	439.4	439.4	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38
	538	540												
	213.02	212.87												

SERVICE

SUPER HIGH PRESSURE STEAM (IBR)

NOTES

8 ALL PIPES,FITTINGS,VALVES,FLANGES,TRAPS AND STRAINERS SHALL BE TESTED AND TEST CERTIFICATE IN FORM III A FOR PIPE AND FORM III C FOR OTHERS SHALL BE REQD. DULY COUNTERSIGNED BY IBR AUTHORITY OR ITS APPROVED REPRESENTATIVE.

14 RADIOGRAPHY SHALL BE PERFORMED AFTER HEAT TREATMENT.

30 ALL COMPONENTS SHALL HAVE A MINIMUM HARDNESS OF 190-250 BHN. MINIMUM HARDNESS OF ALL WELDS, INCLUDING FIELD WELDS AFTER HEAT TREATMENT SHALL BE 190-250 BHN.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

85 ALL WELDED FITTINGS SHALL BE NORMALIZED AND TEMPERED.

135 PIPE THICKNESS HAS BEEN CALCULATED BASED ON ACTUAL LINE CONDITION [130 KG/CM2 @ 540 DEG.C]

145 Y-TYPE GLOBE VALVE.

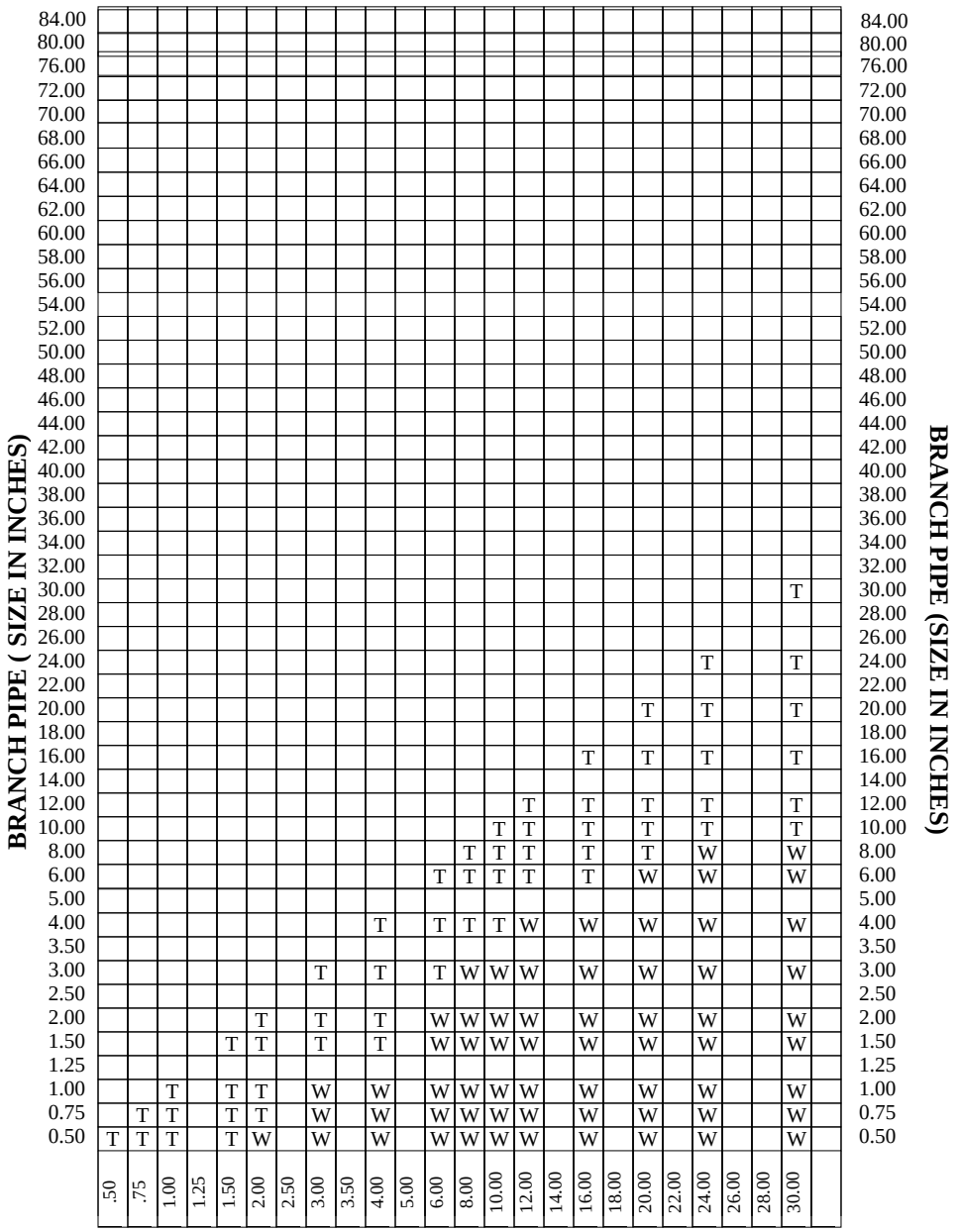
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	ALL	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
VENTS	ON LINES <= 1.5"	AS PER P&ID OR 0.75".TEE, NIPPLE, SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASSEMBLY	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75".WELDOLET,NIPPLE,SINGLE VLV(AS PER P&ID OR LINE ISOLATION VLV), BLIND FLG ASMBLY	
TEMP.CONN	2.0"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	TEE/WELDOLET & NIPPLE WITH DOUBLE VALVES (AS PER P&ID OR SIMILAR TO LINE ISOLATION VALVES)	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G2G** Sheet 2 of 5



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

G2G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G2G** Sheet 3 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	1	S160	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	1.5	1.5	XXS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	2	2	S160	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	3	4	XXS	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	
PIP	PIPE	6	6	XS	B-36.10	ASTM A 335 GR.P91	BE, E.FS.W	PI2K513Z1	135,32
PIP	PIPE	8	12	S100	B-36.10	ASTM A 335 GR.P91	BE, SEAMLESS	PI2K517Z1	135
PIP	PIPE	16	16	S100	B-36.10	ASTM A 691 GR.P91 CL.42	BE, E.FS.W	PI2L813Z1	135
PIP	PIPE	20	20	S100	B-36.10	ASTM A 691 GR.P91 CL.42	BE, E.FS.W	PI2L813Z1	135
PIP	PIPE	24	24	S100	B-36.10	ASTM A 691 GR.P91 CL.42	BE, E.FS.W	PI2L813Z1	135
PIP	PIPE	30	30	47.0	B-36.10	ASTM A 691 GR.P91 CL.42	BE, E.FS.W	PI2L813Z1	135
NIP	NIPPLE	.5	1.5	M	B-36.10	ASTM A 335 GR.P91	PBE, SEAMLESS	PN2K567Z1	
Flange Group									
FLG	FLNG.WN	.5	12	M	B-16.5	ASTM A 182 GR.F91	2500, RTJ/63AARH	FWCB799Z1	
FLG	FLNG.WN	14	24	M	EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FWEB799Z1	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 182 GR.F91	2500, RTJ/63AARH	FBCB799Z1	
FLB	FLNG.BLIND	14	24		EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FBEB799Z1	
FEF	FLNG.FIG.8	.5	4		ASME-B16.48	ASTM A 182 GR.F91	2500, RTJ/63AARH	FGKB799Z1	
FEF	SPCR&BLND	6	12		ASME-B16.48	ASTM A 182 GR.F91	2500, RTJ/63AARH	FCKB799Z1	
FEF	SPCR&BLND	14	24		EIL'STD	ASTM A 182 GR.F91	2500, RTJ/63AARH	FCEB799Z1	
Fitting Group									
ELB90	ELBOW.90	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WAGQ34Z11	
ELB90	ELBOW.90	16	30	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WAGU54Z11	
ELB45	ELBOW.45	.5	14	M	B-16.9	ASTM A234GR.WP91	BW, 1.5D	WBGQ34Z11	
ELB45	ELBOW.45	16	30	M	B-16.9	ASTM A234GR.WP91-W	BW, 1.5D	WBGU54Z11	

Package : IPMCS
Report No. : 50

G2G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G2G** Sheet 4 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TEQ	T.EQUAL	.5	14	M	B-16.9	ASTM A234GR.WP91	BW	WEGQ34ZZ1	
TEQ	T.EQUAL	16	30	M	B-16.9	ASTM A234GR.WP91-W	BW	WEGU54ZZ1	
TRED	T.RED	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WRGQ34ZZ1	
TRED	T.RED	16	30	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WRGU54ZZ1	
REDC	REDUC.CONC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WUGQ34ZZ1	
REDC	REDUC.CONC	16	30	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WUGU54ZZ1	
REDE	REDUC.ECC	.5	14	M, M	B-16.9	ASTM A234GR.WP91	BW	WVGQ34ZZ1	
REDE	REDUC.ECC	16	30	M, M	B-16.9	ASTM A234GR.WP91-W	BW	WVGU54ZZ1	
CAP	CAP	.5	30	M	B-16.9	ASTM A234GR.WP91	BW	WFGQ34ZZ1	
O'let Group									
WLT	WELDOLET	.5	24	M, M	MSS-SP97	ASTM A 182 GR.F91	BW	YWSQ24ZZ1	
Valves Group									
GAV	VLV.GATE	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 51240	51240ZZZ1	
GAV	VLV.GATE	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 51840	51840ZZZ1	
GLV	VLV.GLOBE	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 52240	52240ZZZ1	145
GLV	VLV.GLOBE	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED,STEM-13% CR.STEEL	BW, 2500, B-16.25, SHT NO.- 52840	52840ZZZ1	145
CHV	VLV.CHECK	.5	1.5		ANSI-B-16.34	BODY-ASTM A182 GR.F91,TRIM-STELLITED	BW, 2500, B-16.25, SHT NO.- 53240	53240ZZZ1	
CHV	VLV.CHECK	2	4		ANSI-B-16.34	BODY-ASTM A 217 GR.C12A,TRIM-STELLITED	BW, 2500, B-16.25, SHT NO.- 53840	53840ZZZ1	
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B16, NUT:A194		BS40134Z0	

Package : IPMCS
Report No. : 50

G2G

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :G2G** Sheet 5 of 5

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Bolt Group									
						GR.7			
BOS	BOLT.STUD	14	24		B-18.2	BOLT:A193 GR.B16, NUT:A194 GR.7		BS40134Z0	
Gasket Group									
GAS	GASKET	.5	12		B-16.20-ANSI B16.5	5%CR 0.5%Mo	OCT-RING, 2500	GK67339Z0	
Trap/Strainer Group									
TRP	TRAP.STEAM	.5	1.5		MNF'STD	B:A182GR.F91;INT:SS304	BW, THRMDNMC	TR3F545Z1	
PSR	STRNR.PERM	.5	1.5	M	MNF'STD	B:A182GR.F91;INT:SS304	BW, Y-TYPE	SP3F545Z1	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J2A** Sheet 1 of 4

PIPE CLASS : **J2A**
RATING : 150
BASE MATERIAL : CS (Galv.)
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	65
PRESS	10.55	10.55	10.55

SERVICE

DRINKING WATER (ABOVE GROUND / UNDER GROUND), FIRE WATER-SPRINKLER SYSTEM U/G ,A/G AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM.

NOTES

19 THREADED JOINTS SHALL BE MADE WITH 1" WIDTH PTFE JOINING TAPE.

20 SURFACES WHERE GALVANISING HAS BEEN BURNT OFF SHALL BE WIRE BRUSHED AND COLD GALVANISED WITH ZINC COATING COMPOUND.

87 FOR BRANCH CONNECTION "X", USE EQUAL TEE/REDUCING TEE WITH NIPPLE AND REDUCING COUPLING.

151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

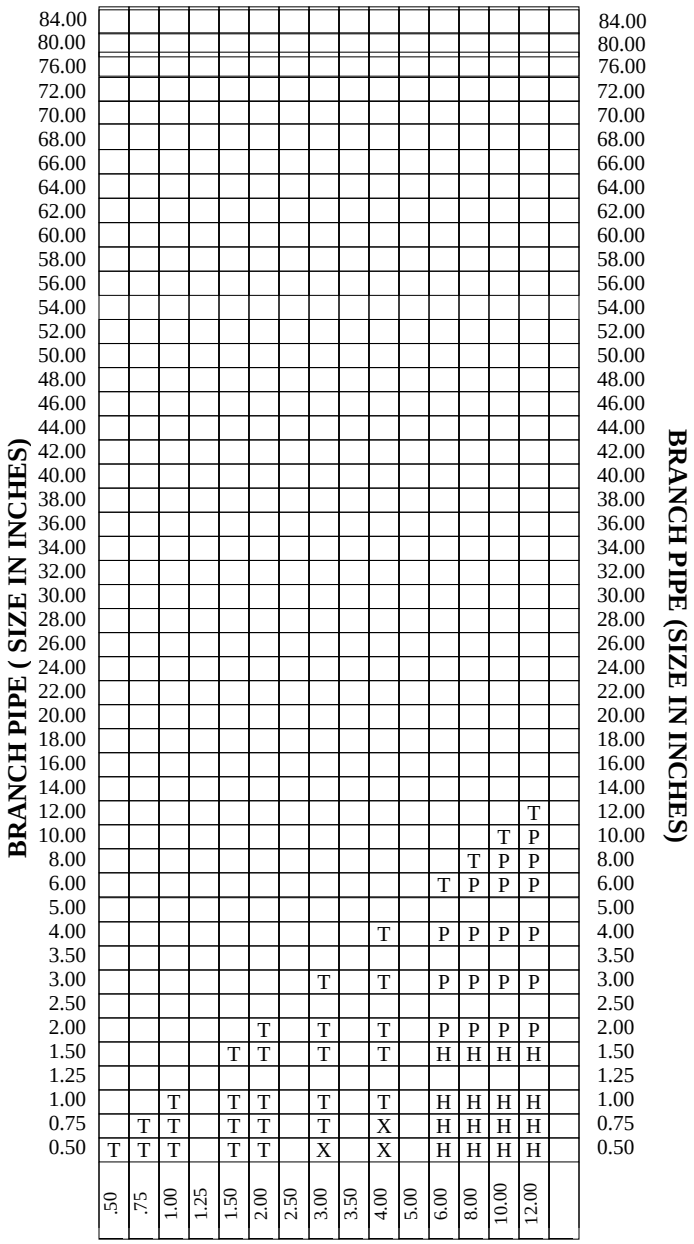
157 MINIMUM SOIL COVER FROM TOP OF PIPE SHALL BE 600 MM FOR SIZES UPTO 24" AND 800 MM FOR SIZES 26" TO 36".

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	1.5" & BELOW	UNIONS (SCRF) TO BE KEPT MINIMUM	
	2" & ABOVE	FLANGED (SCREWED) TO BE KEPT MINIMUM	
PIPE JOINTS	UPTO 4"	SCREWED COUPLING	
	6" & ABOVE	BUTT WELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DC3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	REFER EIL STD 7-440350, VC3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V3	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SCRD NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J2A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

J2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J2A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	157
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	157
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	157
PIP	PIPE	3	4	STD	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	157
PIP	PIPE	6	12	STD	B-36.10	ASTM A 106 GR.B(GALV)	BE, SEAMLESS	PI22217Z0	157
Flange Group									
FLG	FLNG.SCRD	.5	4		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FTC0721Z0	
FLG	FLNG.SO	6	12		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FNC0721Z0	
FLB	FLNG.BLIND	.5	12		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FBC0721Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105(GALV.)	150, FF/125AARH	FGK0721Z0	
FEF	SPCR&BLND	10	12		ASME-B16.48	ASTM A 105(GALV.)	150, FF/125AARH	FCK0721Z0	
Fitting Group									
ELB90	ELBOW.90	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WA60882Z0	
ELB90	ELBOW.90	6	12	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW, 1.5D	WAG714Z10	
ELB45	ELBOW.45	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WB60882Z0	
ELB45	ELBOW.45	6	12	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW, 1.5D	WBG714Z10	
TEQ	T.EQUAL	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WE60882Z0	
TEQ	T.EQUAL	6	12	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WEG714ZZ0	
TRED	T.RED	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WR60882Z0	
TRED	T.RED	6	12	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WRG714ZZ0	
REDC	REDUC.CONC	6	12	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WUG714ZZ0	
REDE	REDUC.ECC	6	12	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WVG714ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105(GALV)	TBE	WNH08EZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105(GALV)	TBE	WPH08EZZ0	

Package : IPMCS
Report No. : 50

J2A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J2A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
CAP	CAP	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WF60882Z0	
CAP	CAP	6	12	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WFG714ZZ0	
CPLF	CPLNG.FULL	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WJ60882Z0	
CPLH	CPLNG.HALF	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WK60882Z0	
CPLL	CPLNG.LH	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WL60882Z0	
CPLR	CPLNG.RED	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WM60882Z0	
UNN	UNION	.5	4		BS-3799	ASTM A 105(GALV)	SCRF, 3000	WQH0882Z0	
Valves Group									
GAV	VLV.GATE	.5	1.5		IS:778 CL.2	BODY-IS 318 GR.LTB2 (LEADED TIN BRONZE),TRIM- IS 320 ALLOY HT2	SCRF, CL.2, 3000, B-1.20.1, SHT NO.- 51080	51080ZZZ0	
GAV	VLV.GATE	2	6		IS:14846	BODY-IS 210 GR.FG 200,TRIM-IS 320 ALLOY HT2	FLGD, PN1.6, B-16.1, FF/125AARH, SHT NO.- 51380	51380ZZZ0	
GLV	VLV.GLOBE	.5	1.5		IS:778 CL.2	BODY-IS 318 GR.LTB2 (LEADED TIN BRONZE),TRIM- IS 320 ALLOY HT2	SCRF, CL.2, 3000, B-1.20.1, SHT NO.- 52080	52080ZZZ0	
GLV	VLV.GLOBE	2	6		IS:9338	BODY-IS 210 GR.FG 200,TRIM-IS 320 ALLOY HT2	FLGD, PN1.6, B-16.1, FF/125AARH, SHT NO.- 52380	52380ZZZ0	
CHV	VLV.CHECK	.5	1.5		IS:778 CL.2	BODY-IS 318 GR.LTB2 (LEADED TIN BRONZE),TRIM- IS 320 ALLOY HT2	SCRF, CL.2, 3000, B-1.20.1, SHT NO.- 53080	53080ZZZ0	
CHV	VLV.CHECK	2	6		IS:5312 (PT-1)	BODY-IS 210 GR.FG 200,TRIM-IS 320 ALLOY HT2	FLGD, PN1.6, B-16.1, FF/125AARH, SHT NO.- 53380	53380ZZZ0	
Bolt Group									
BOS	BOLT.STUD	.5	12		B-18.2	BOLT:A193 GR.B7(GALV), NUT:A194 2H(GALV)		BS40513Z0	
Gasket Group									
GAS	GASKET	.5	12		B-16.21-ANSI B16.5	BUTYL RUBBER	FULLFACE, 150, 2 MM	GKB0422Z0	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J95A** Sheet 1 of 4

PIPE CLASS : **J95A**
RATING : 150
BASE MATERIAL : CS (Galv.)
CORROSION ALLOWANCE : 0 MM
SPECIAL REQUIREMENT :

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	65
PRESS	18.9	18.9	18.9

SERVICE

FIRE WATER-SPRINKLER SYSTEM, WATER & FOAM SOLUTION (U/G& A/G) AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM

NOTES

19 THREADED JOINTS SHALL BE MADE WITH 1" WIDTH PTFE JOINING TAPE.

20 SURFACES WHERE GALVANISING HAS BEEN BURNT OFF SHALL BE WIRE BRUSHED AND COLD GALVANISED WITH ZINC COATING COMPOUND.

87 FOR BRANCH CONNECTION "X", USE EQUAL TEE/REDUCING TEE WITH NIPPLE AND REDUCING COUPLING.

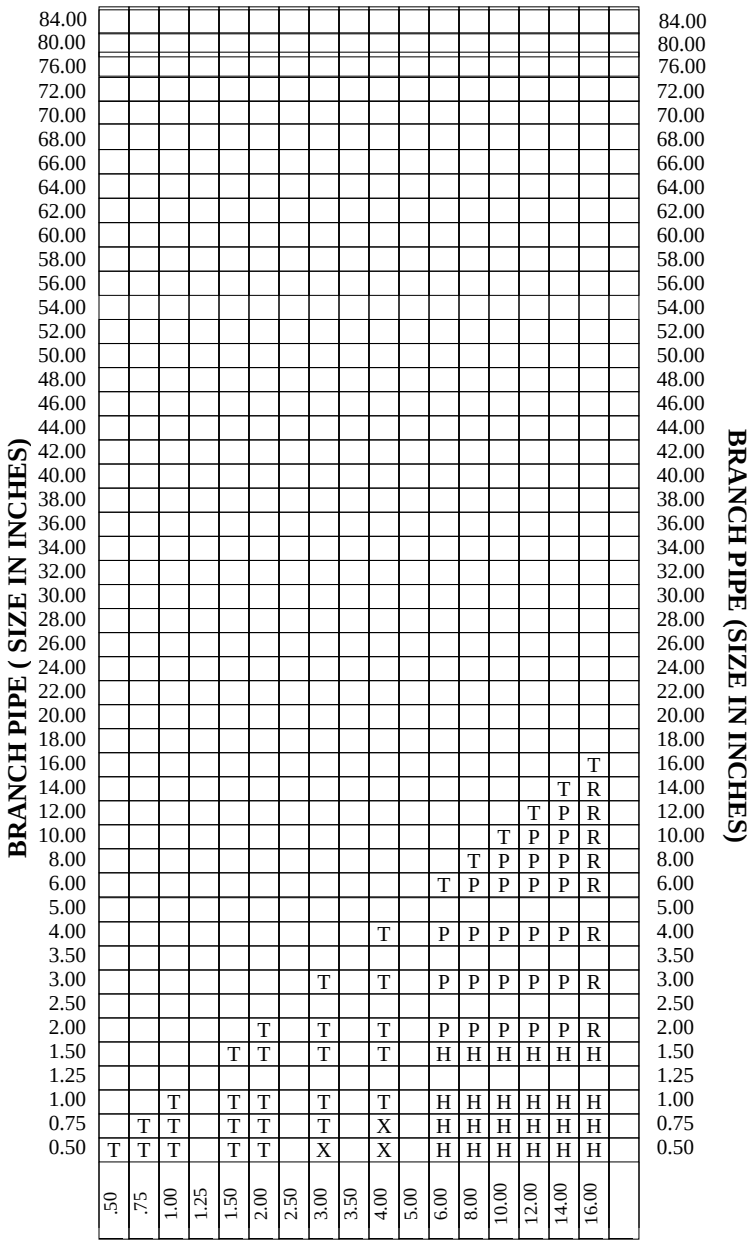
151 NDT REQUIREMENTS AS PER JOB SPECIFICATION B957-6-44-0016

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	1.5" & BELOW	UNIONS (SCRF) TO BE KEPT MINIMUM	
	2" & ABOVE	FLANGED (SCREWED) TO BE KEPT MINIMUM	
PIPE JOINTS	UPTO 4"	SCREWED COUPLING	
	6" & ABOVE	BUTT WELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DC3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D3	
VENTS	ON LINES <= 1.5"	REFER EIL STD 7-440350, VC3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V3	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SCRD NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J95A** Sheet 2 of 4



CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H. COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3
R	REINFORCED	**X**	Refer Notes		
S	SOCKOLETS	**L**	SWEEPOLET		

Package : IPMCS
Report No. : 50

J95A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J95A** Sheet 3 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	.5	.75	S160	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	
PIP	PIPE	1	1.5	XS	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	
PIP	PIPE	2	2	XS	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	
PIP	PIPE	3	4	STD	B-36.10	ASTM A 106 GR.B(GALV)	SCRM, SEAMLESS	PI22297Z0	
PIP	PIPE	6	14	STD	B-36.10	ASTM A 106 GR.B(GALV)	BE, SEAMLESS	PI22217Z0	
PIP	PIPE	16	16	6.0	IS-3589	IS-3589 GR.410 (GALV)	BE, SAW	PI7E516Z0	
Flange Group									
FLG	FLNG.SCRD	.5	4		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FTC0721Z0	
FLG	FLNG.SO	6	16		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FNC0721Z0	
FLB	FLNG.BLIND	.5	16		B-16.5	ASTM A 105(GALV.)	150, FF/125AARH	FBC0721Z0	
FEF	FLNG.FIG.8	.5	8		ASME-B16.48	ASTM A 105(GALV.)	150, FF/125AARH	FGK0721Z0	
FEF	SPCR&BLND	10	16		ASME-B16.48	ASTM A 105(GALV.)	150, FF/125AARH	FCK0721Z0	
Fitting Group									
ELB90	ELBOW.90	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WA60882Z0	
ELB90	ELBOW.90	6	14	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW, 1.5D	WAG714Z10	
ELB90	ELBOW.90	16	16	M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW, 1.5D	WAG764Z10	
ELB45	ELBOW.45	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WB60882Z0	
ELB45	ELBOW.45	6	14	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW, 1.5D	WBG714Z10	
ELB45	ELBOW.45	16	16	M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW, 1.5D	WBG764Z10	
TEQ	T.EQUAL	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WE60882Z0	
TEQ	T.EQUAL	6	14	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WEG714ZZ0	
TEQ	T.EQUAL	16	16	M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW	WEG764ZZ0	
TRED	T.RED	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WR60882Z0	
TRED	T.RED	6	14	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WRG714ZZ0	

Package : IPMCS
Report No. : 50

J95A

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Client :BPCL	**Dept./Sect. :** 16/43
Project :MPMC & EPCM-1 FOR BPREP	
Location BINA, MADHYA PRADESH	**Pipe Class :J95A** Sheet 4 of 4

Note :(The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn. STD	Material	Description	Commodity Code	Note No
Fitting Group									
TRED	T.RED	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW	WRG764ZZ0	
REDC	REDUC.CONC	6	14	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WUG714ZZ0	
REDC	REDUC.CONC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW	WUG764ZZ0	
REDE	REDUC.ECC	6	14	M, M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WVG714ZZ0	
REDE	REDUC.ECC	16	16	M, M	B-16.9	ASTM A 234 GR.WPB-W(GALV)	BW	WVG764ZZ0	
SWGC	SWAGE.CONC	.5	3	M, M	BS-3799	ASTM A 105(GALV)	TBE	WNH08EZZ0	
SWGE	SWAGE.ECC	.5	3	M, M	BS-3799	ASTM A 105(GALV)	TBE	WPH08EZZ0	
CAP	CAP	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WF60882Z0	
CAP	CAP	6	16	M	B-16.9	ASTM A 234 GR.WPB(GALV)	BW	WFG714ZZ0	
CPLF	CPLNG.FULL	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WJ60882Z0	
CPLH	CPLNG.HALF	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WK60882Z0	
CPLL	CPLNG.LH	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WL60882Z0	
CPLR	CPLNG.RED	.5	4		B-16.11	ASTM A 105(GALV)	SCRF, 3000	WM60882Z0	
UNN	UNION	.5	4		BS-3799	ASTM A 105(GALV)	SCRF, 3000	WQH0882Z0	
Bolt Group									
BOS	BOLT.STUD	.5	16		B-18.2	BOLT:A193 GR.B7(GALV), NUT:A194 2H(GALV)		BS40513Z0	
Gasket Group									
GAS	GASKET	.5	16		B-16.21-ANSI B16.5	BUTYL RUBBER	FULLFACE, 150, 2 MM	GKB0422Z0	

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ANNEXURE – I (TO PMS)

JOB
PIPING MATERIAL SPECIFICATION
GENERAL NOTES

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	28.02.2025	ISSUED FOR ENGINEERING	PK	MMK	SNH

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Abbreviations:

AARH	: Arithmetic Average Roughness Height
ANSI	: American National Standards Institute
API	: American Petroleum Institute
ASME	: American Society of Mechanical Engineers
ASTM	: American Society for Testing and Materials
AWWA	: American Water Works Association
BIS	: Bureau of Indian Standards
BSI	: British Standards Institute
BW	: Butt Weld
CA	: Corrosion Allowance
DIN	: Deutsches Institut für Normung
FRP	: Fiber Reinforced Plastic
GOST	: Russian Standard (Gosudarstvennyy Stan dart)
HDPE	: High Density Poly Ethylene
IBR	: Indian Boiler Regulations
JIS	: Japanese Industrial Standards
LTCS	: Low Temperature Carbon Steel
MSS	: Manufacturers Standardization Society
NACE	: National Association of Corrosion Engineers
NDT	: Non Destructive Testing
PMS	: Piping Material Specification
PP	: Poly Propylene
PTFE	: Poly Tetra Flouro Ethylene
PVC	: Poly Vinyl Chloride
PVDF	: Poly Vinylidene Flouride
RTJ	: Ring Type Joint
SW	: Socket Weld

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1.0 SCOPE

1.1 This specification (PMS) covers the various piping classes for Process and utility Piping.

1.2 Deviations from this specification may be necessary to conform to specific job requirements.

1.3 PMS for PPU and LLDPE/HDPE Swing unit shall be read in conjuction with Licensor PMS.

1.4 PMS for PPU has been prepared for the preferred component listed in Licensor PMS. If any special piping components are listed in the Process design package or P&ID, corresponding Licensor class shall be followed for reference.

2.0 REFERRED CODES & STANDARDS

2.1 All Piping shall be designed in accordance with the Process Piping Code, ASME B31.3. A particular edition (indicated in Design Basis), once selected shall be followed throughout the job.

2.2 Editions and addenda (if any) of referred Codes and Standards shall be as per the Job Engineering Design Basis (Piping).

2.3 For the sake of brevity, the initials of the society to which the codes are referred to may be omitted in the specification. For example; B16.5 is a code referring to ASME; A106 is a standard referring to ASTM.

3.0 MATERIAL SPECIFICATIONS

3.1 Individual piping Class has been generally designed to cover a set of services operating within pressure-temperature combination as per ASME B16.5 / B16.34 or part of it.

3.2 The PMS shall be strictly adhered to in the design, requisitioning, purchasing, fabrication and testing of the piping system. However, deviations of material may occur due to design conditions and/or availability. All substitutions must be duly approved.

3.3 Piping components as per “MNF STD” or “Unlisted components as per B31.3” shall be designed and qualified as per clause 304.7.2 for unlisted components.

3.4 For Valves, material requirements specified in Annexure “D’ of API 600 shall be followed.

3.5 Where trim nos. have been specified, the same shall be as per API 600.

3.6 In cases where 'D/t' ratio exceeds 100, components shall be treated as unlisted components and designed according to B31.3. ‘D’ is outer dia. and ‘t’ is nominal thickness for all other components except branches where 't' is minimum thickness as per purchase specification.

3.7 Unless mentioned otherwise, pipe thicknesses in the specs are for above ground piping.

4.0 CLASS DESIGNATION CODE

The class designation shall consist of not more than three components made up of a letter, number & letter; e.g.B1A.

4.1 The first letter indicates pressure rating.

A	150 Class	D	600 Class	G	2500 Class
B	300 Class	E	900 Class	J	125/150 Class
C	400 Class	F	1500 Class	K	UNCLASSIFIED

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4.2 The middle number indicates difference in the specifications within the same rating and material as enlisted in the Table attached.

4.3 The third letter indicates type of material.

A	Carbon
B	Carbon Moly. (This material is not recommended)
C	1.0 % Cr., 0.5 % Moly. (This material is not recommended)
D	1.25 % Cr., 0.5 % Moly.
E	2.25 % Cr., 1.0 % Moly.
F	5.0 % Cr., 0.5 % Moly.
G	9.0 % Cr., 1.0 % Moly.
H	3.5 % Ni.
I	
J	Nickel / Titanum
K	Stainless steel type 304, 304H, 304L.
L	Aluminium
M	Stabilised stainless steel type 321, 347 and Stainless steel type 316, 316H.
N	316L
P	Monel / Alloy 20
Q	Hastalloy / Inconel / Incoloy
R	Lead
S	PVC & FRP, PP / FRP, PVDF / FRP
T	Cast Iron / Silicon Iron
U	
V	Duplex Stainless Steel
W	Cupro-Nickel
Y	Lined steel (Rubber Lined, Teflon Lined, Cement lined etc).
Z	HDPE / PDVF / Teflon / PVC

5.0 PIPES

5.1 Pipe dimension shall be in accordance with ASME B36.10, IS:1239 & IS:3589 for wrought steel and wrought iron pipe; to B36.10 / B36.19 for stainless steel pipe and respective ASTM Standard for non-ferrous and non- metallic pipes.

5.2 Pipe made by acid-bessemer process shall not be acceptable, steel pipe shall be made by open hearth, electric furnace or basic Oxygen process.

5.3 All pipe threads shall conform to ASME B1.20.1 except where otherwise noted.

5.4 Pipe thicknesses not covered in different classes of this specification shall be calculated to meet specific job requirement based on actual max. design condition to economise on thickness. However, in such cases the thickness shall be calculated at not less than 80% of class rating unless defined otherwise in the Job Engineering Design Basis (Piping).

5.5 Maximum of 10% of Corrosion Allowance may be adjusted to optimize on pipe schedule. However, if CA is suffixed by 'minimum', this downward adjustment shall not be used.

5.6 Non-standard pipe sizes 1¼", 2½", 3½", 5" and 22" shall not be treated as a part of this specification unless these sizes are separately called out.

6.0 FLANGES

6.1 Flanges shall be in accordance with the following codes, except where otherwise noted:

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Upto 24" (150# -1500#)	ASME B16.5
Upto 12" , 2500#	ASME B16.5
Above 24"	ASME B16.47 SERIES 'B' / AWWA / EIL' STD.

Flanges to ASME B16.47 SERIES 'A' or any other standard (e.g. DIN, GOST, JIS etc.) may be specified to mate with equipment or valve flanges with the corresponding bolting.

6.2 Finish of steel flange faces shall be as follows:

Stock Finish	:	1000 µin AARH max.
Serrated Finish / 125 AARH / Smooth finish	:	Serrations with 125-250µin AARH
63 AARH	:	32 TO 63 µin AARH

6.3 Brinnel hardness for RTJ groove shall be atleast 20 BHN more than that of corresponding gasket as specified.

6.4 Fig.8 Fl and SPCR & BLN shall be as per B16.48 upto 24" (150-1500#) & upto 12" for 2500#. For other sizes, refer EIL Std 7-44-0162.

7.0 FITTINGS

7.1 Forged steel SW and threaded fittings shall be in accordance with ASME B16.11, unless otherwise specified. For items not covered under B16.11, reference may be made to BS 3799 or appropriate MSS-SP-Std.

7.2 BW Fittings shall be in accordance with ASME B16.9, unless otherwise specified.

7.3 Dimensions of steel BW fittings for sizes not covered in ASME B16.9 shall conform to MSS-SP-48.

7.4 Usage of unions shall be restricted to utilities only.

8.0 BENDS, MITRES AND REDUCERS FABRICATED FROM PIPE

8.1 Mitres and Reducers fabricated from Pipe may be used if specified in particular Piping Class. Mitres require higher thickness than corresponding Pipe / Elbow to hold the same pressure (Refer ASME B31.3).

9.0 GASKETS

9.1 Non-metallic gaskets shall conform to B16.21 (corresponding to B16.5) upto 24", and B16.21 (corresponding to B16.47B) beyond 24", unless otherwise specified.

9.2 Spiral wound gaskets (SP.WND or SPWD) and Ring Joint gaskets shall conform to B16.20.

9.3 Inner rings shall be provided for all Spiral Wound Gaskets. For spiral wound gaskets, material of Inner Compression ring shall be same as Spiral Strip material.

10.0 BOLTING

10.1 All bolts shall conform to B18.2.1, nuts to be B18.2.2. Reference shall also be made to B16.5 for studs.

10.2 Threads shall be to coarse Thread Series, B1.1, having Class 2A allowances for bolts and studs, and Class 2B tolerance for nuts.

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10.3 Nuts for Bolts and Studs shall be the American Standard Hexagon Heavy Series.

10.4 When specified as "GALV.", the studs, M/C bolts and nuts shall be 'hot dip zinc coated' in accordance with requirements of 'class C' of `ASTM A 153'. As an alternative, electrogalvanizing as per IS 1573, 'Service Grade Number 2' is also acceptable. However, for bolting where "HDG" has been specified, only 'hot dip zinc coating' in accordance with requirements of 'class C' of `ASTM A 153' is acceptable.

11.0 THREADS

11.1 Threads for threaded Pipes, Fittings, Flanges and Valves shall be in accordance with B1.20.1 taper threads, unless otherwise specified.

11.2 Upto 204 deg.C, threaded joints shall be made with 1" width PTFE joining tape.

11.3 Above 204 deg.C, threaded joints shall be seal welded with a full strength fillet weld.

11.4 All threaded joints irrespective of pressure and temperature on lines carrying toxic fluid shall be seal welded with a full strength fillet weld.

12.0 VALVES

12.1 Face to Face / End to End dimension of valves shall conform to B16.10 to the extent covered. For valves not covered in B16.10, reference shall be made to BS EN 558-1 for PN Designated Flanged valves, BS EN 558-2 for Class designated Flanged valves and BS EN 12627 for Butt Welding end valves and / or the manufacturer's drawings.

12.2 Flange / weld ends of the valve shall be as per the corresponding Flange / Fitting ends of the piping class, unless otherwise specified.

12.3 Pressure-temperature rating for flanged and butt welding end valves shall be as per ASME B16.34 except for ball, plug & butterfly valves. For these valves refer TABLE FOR PRESSURE-TEMP RATING FOR BALL, PLUG AND BUTTERFLY VALVES. Wall thickness of valve body at different locations should not be less than as calculated as per B16.34.

12.4 Unless called-out specifically, valves shall be as per the following Standards:

Valve	Size	Rating	Des. Std.	Testing Std.
Gate	1/2"- 1-1/2"	800 / 1500	'API 602/ ISO 15761'	API-598
Globe / Check	-do-	800 / 1500	'API 602/ ISO 15761'	API-598
Gate	2"-24"	150 / 300 / 600	'API 600/ ISO 10434'	API-598
Gate	26"-42"	150 / 300	B-16.34	'API 598'/ 'BS EN 12266-1'
Globe	2"-16"	150	BS-1873	'BS EN 12266-1'
Globe	2"-12"	300/600	BS-1873	-do-
Check	2"-24"	-do-	BS-1868	-do-
Gate/ Globe/Check	2"-8"	900 / 1500 / 2500	B-16.34 (Refer 12.6 also)	'API 598' / 'BS EN 12266-1'

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Ball	1/2"-16"	150 / 300 / 600	'BS EN ISO 17292' / 'API 6D'	'BS EN 12266-1' / 'API-598'
Ball	1/2"-8"	900/ 1500	API 6D	API-598
Plug	1/2"-12"	All	'API-599' /'BS 5353'	'API-598' / 'BS EN 12266-1'
Btrfly	3" & above	All	'API-609' / 'BS EN 593' / 'AWWA C504'	'API-598' /' BS EN 12266-1'/ 'AWWA'
Diaphram	ALL	-	BS-5156	'BS EN 12266-1'
Bronze			RELEVANT IS STD.	RELEVANT IS STD.
Cast Iron			RELEVANT IS STD.	RELEVANT IS STD.

12.5 If not covered in 12.3, the valve shall be as per B16.34 / relevant MSS-SP Standard.

12.6 For details of the valves specifications, refer specifications 6-44-0006. Features not covered by 6-44-0006 and the relevant code shall be to the manufacturer's standard.

12.7 Unless otherwise specifically called for, upto 600# rating, 2" and larger size steel Gate, Globe & Check valves in Hydrocarbon and utility service shall have bolted bonnets. Pressure-seal bonnets or covers shall be used for Classes 900# and above to minimize bonnet leakage. However, valves with Pr-seal Bonnet shall have wall thickness & stem diameter as per API-600, (if required). Welded bonnets or screwed & seal welded bonnets are acceptable for sizes lower than 2" for Classes 900# & above.

12.8 In TEAL service, only licensor recommended vendors shall be considered for supply of valves.

13.0 For Non-Destructive Testing (NDT) specification , refer EIL' STD B957-6-44-0016.

14.0 For Welding specifications, refer EIL specs. 'Welding Specification for fabrication of piping(6-77-0001 & B957-999-06-41-WSP-0001)' & 'Welding charts for piping classes (B957-999-06-41-WSC-0001)'.

15.0 For 'Caustic Soda service graph' refer sheet 20 of 20.

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TABLE FOR MIDDLE NUMBER

Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
1	CA=1.5 General Process, Condensate	CA=1.5	CA=NIL (SS304)	CA=NIL (SS316)
2	CA=1.5 Steam & Boiler Feed Water (IBR)	CA=1.5 Steam (IBR)	CA=NIL (SS304-CRYO)	CA=NIL (SS321-CRYO)
3	CA=1.5 (CAT'D) PLANTAIR, NITROGEN, SERVICE WATER, INSTRUMENT AIR-OFFSITES	CA=6.0	CA=NIL (CAT 'D' SS304) INSTRUMENT AIR-UNITS	CA=1.5 (SS321) HYDROCARBON
4	CA=1.5 (LTCS)	CA=3.0 GENERAL PROCESS	CA=1.5 (SS304H)	CA=NIL (SS321)
5	CA=1.5 (Hydrogen)	CA=1.5 (Hydrogen)>230^{O}C	CA=3.0 (SS304H)	CA=NIL (SS316H) – H_2
6	CA=4.5 General Process	CA=4.5	CA=1.5 (SS304L)	CA=NIL (SS316H)
7	CA=1.5 (Vacuum)		CA=NIL (SS304L-Vacuum)	CA=NIL (SS347)
8	CA=1.5 (Conc.Sulphuric Acid)		CA=1.5 (SS304L-CRYO)	CA=1.5 (SS347)
9	CA=3.0		CA=1.5 (SS304)	CA=1.5 (SS316)
10	CA=1.5 (Offsites)			
11	CA=3.0 (Hardness controlled)		CA=NIL (SS304L)	
12			CA=NIL (SS304-IBR)	
13	CA=6.0			
15	CA=3.0 (Core Jacketed Piping)		CA=1.5 (SS304 H_2 & CO_2)	CA=1.5 (SS321H - H_2)
16	CA=4.5 (NACE)	CA=4.5 (NACE)	CA=1.5 (SS304L - NACE)	CA=1.5 (SS321 - NACE)
17	CA=3.0 (dry Chlorine)			
18	CA=1.5 (Oxygen)		CA=NIL (SS304L-Oxygen)	
19	CA=3.0 (Caustic / Amine, Stress relieved)			
20	CA=1.5 (Jacket for A15A)	CA=3.0 (IBR)	CA=NIL SS304/304L DUAL; T2, SLURRY, PRECURSOR	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
			(PPU: LGP09, LGP27, L7E28)	
21	CA=1.5 T2; SLURRY CATALYST AND PRECURSOR (PPU: LGP01, LGP16)		CA=NIL SS304/304L DUAL; HYDROCARBON & HP NITROGEN, CHEMICAL, VENTS (PPU:L7G7 & L7C8F)	
22	CA=1.5 IBR ASME SEC- I (LUMMUS PMS CLASS-F1AS)	CA=1.5 IBR ASME SEC- I (LUMMUS PMS CLASS-F54AS/G54AS/G58AS)		
23		CA=4.5 GENERAL PROCESS (LUMMUS PMS CLASS-D56F)	CA=NIL SS304/304L RESIN GRAVITY FLOW; ROTARY FEEDER VENTS PPU & UNIVATION: L7A1	CA=0 SS321 HYRDOCARBON (LUMMUS PMS CLASS-D26A)
24	CA=1.5 HYDROCARBON PROCESS, NITROGEN – CYCLIC PPU: LGP08, LGP21		CA=NIL SS304/304L DUAL CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE PPU: LGP41	
25	CA=1.5 CARBON MONOXIDE, REACTION KILL PPU: LGP36			
26				
27	CA=1.5 PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) PPU: LGZ18		CA = 0 DENSE PHASE CONVEYING; DILUTE PHASE CONVEYING; ADDITIVE CONVEYING LLDPE SWING: 7C50	
28	CA=1.5 CYCLE GAS, CYCLIC SERVICE NITROGEN		CA=NIL SS304/304L DUAL RESIN	CA=NIL SS316/316L DUAL RESIN CONVEYING

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	PPU:LGP24, LPZ04		CONVEYING / DILUTE PHASE / PELLETS PPU: LC52	GRAVITY FLOW PPU: LGP40
29			CA=NIL SS304/304L DUAL TUBING CHEMICALS; PPU: LC51	
32	CA=1.5 (Tracing)		CA=NIL (Tracing)	
33	CA=1.5 (Fire Water)			
34			CA = 0MM SS304/304L DUAL PROCESS TUBING – RO, CATALYST BLOW BACK PPU:LGP55	CA = 0MM CHEMICALS (TUBING) LLDPE SWING: 6G71
35				CA = 0MM ADDITIVES (ADDITIVES) LLDPE SWING: 6G73
36	CA = 1.5 KILL GAS, HYDROGEN LLDPE SWING: 1G4/1G4A, 1K6		CA = 0 HYDROGEN, KILL GAS LLDPE SWING: 6G57, 7K6	
37			SS304 Tubing : General Purpose LLDPE SWING: 6G69	
40	CA=3 MM LTCS (LUMMUS PMS CLASS-A2A,B2A,D2A,E2A)			
41	CA=1.5 CS HC, OFFGAS, N-HEXANE/C6, BUTENE VAPOR,N2, LIQ. BUTENE CATALYST (AXENS PMS CLASS: A1A, B1A)		CA=0 SS316 VALVES CRYO (LUMMUS PMS CLASS-A21K/A21L/B21K/B21L/D21K/D21L/E21K)	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
42	CA=1.5 LTCS CLEAN HYDROCARBONS (mixture ethylene/butene) At low temperature (or risk of low temp) - 45°C MINI LIQUID BUTENE (AXENS PMS CLASS A1K, B1K, C1K)		CA=NIL SS304/304L DUAL; CRYO HYDROCARBON. HP NITROGEN, HC-FLARE (PPU:L6E57, L6G5, LC62, LGP45)	
43	CA=1.5 LTCS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY), LIQUID BUTENE (AXENS PMS CLASS A2K, B2K)		CA = 0 HYDROCARBONS LLDPE SWING: 6E57	
44	CA=1.5 CS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) (AXENS PMS CLASS A2A, B2A)		CA=0.75 SS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) (AXENS PMS CLASS A2S, B2S)	
45	CA=1.5 CS SPENT CATALYST HC SLURRY) (AXENS PMS CLASS A3A, B3A)		CA=0.75 SS SPENT CATALYST HC SLURRY) (AXENS PMS CLASS A2S, B2S)	
46	CA=1.5 LTCS HC SLURRY (POLYMER+CATALYS T) EFFLUENT, EVAPORATION LINES (BUTENE UNIT) (AXENS PMS CLASS A3K, B3K)		CA=NIL SS304/304L DUAL; CRYO + CYCLIC SERVICE PRODUCT DISCHARGE (PPU: LGP44)	
47	CA=1.5 LTCS HYDROCARBONS, HP NITROGEN LLDPE SWING: 2E63			
48	CA=1.5 LTCS			

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	CONVEYING SOLIDS LLDPE SWING: 2E65			
49	CA			
50				
51				
52	CA=3.0mm H2 (LUMMUS PMS CLASS-A1E/B1E/D1E)	CA=3.0mm H2 (LUMMUS PMS CLASS-D54E)		
53		CA=6.0 H2		
54			CA=NIL (DUAL SS304/304L-H2) PPU:LPZ17	
55	CA=1.5 MM H2 PPU: LGP57, LGP31		CA=NIL SS304/304L DUAL; HYDROGEN, KILL GAS (PPU:L7K6D)	
56				
57				
58				
59				
60	CA=1.5 NACE-PWHT		CA=NIL SS304L-NACE (LUMMUS PMS CLASS-A22A/B22A)	
61	CA=3.0 NACE-PWHT (LUMMUS PMS CLASS-A1WR/B1WR)			
62	CA=6.0 NACE-PWHT (LUMMUS PMS CLASS-A1WS/B1WS)			
68				
69	CA=6.0 CAUSTIC SERVICE, MONEL TRIM VALVES (LUMMUS PMS CLASS-A1NR)			CA=0 SPENT CAUSTIC (WAO UNIT)
71	CA=3.0mm		CA=0	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	(LUMMUS PMS CLASS-A1DV/B1DV)		(SS304-VACUUM) (LUMMUS PMS CLASS-A21PB)	
81	CA=1.5 Alkyls, Additives, Chemicals, Chlorinated Chemicals LLDPE SWING:1C17, 1E20, 1K8		CA=0 ALKYLS LLDPE SWING:7C28, 7E28	
82	Ca=1.5 MM CONVEYING SOLIDS LLDPE SWING:1C14, 1E23			
83	CA=3.0mm H2SO4 ALLOY20 VALVES (LUMMUS PMS CLASS-A1F)			
84	CA=1.5 LLDPE CYCLE GAS LLDPE SWING: 1E22			
85				
86	CA=1.5 MM Reactor Product Discharge - Product Conveying LLDPE SWING: 1E64			
87	CA=3 MM Benzene (LUMMUS PMS CLASS-A1D)			
88	CA = 1.5 CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN LLDPE SWING: 1C11 & 1E18			
89	CA=1.5 MM Cycle Pipe LLDPE SWING: 1E87			
91	CA=1.5 U/G Cooling Water,			

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	3LPE COATED			
92			CA=0mm SS316 SS VALVES (LUMMUS PMS CLASS-A21A/B21A/F21B)	
93	CA=1.5 Construction Water, Grey water A/G			
94	CA=1.5 A/G Fire Water-Fresh Water			CA=0 Concentrate Foam
95	CA=1.5 CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING			
96	CA= 1.5 CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING			
97	CA=1.5 U/G Fire Water, 3LPE COATED			
98				
99	CA=3.0mm MONEL TRIM VALVES (LUMMUS PMS CLASS-A1NR/B1NR)			

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE “S” OR “X”) FOR PROJECT DEPENDENT CLASSES.

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TABLE FOR MIDDLE NUMBER

Middle Number	SS316L N	NICKEL /TITANUM J	ALLUMINIUM L	MONEL / ALLOY 20 P
1	CA=NIL	CA=NIL (NICKEL)		CA=NIL (MONEL)
2	CA=1.5 (CRYO)	CA=1.5 (NICKEL)		CA=1.5 (MONEL)
3		CA=NIL (TITANUM)		CA=NIL(ALLOY 20)
4		CA=1.5 (TITANUM)		CA=1.5 (ALLOY 20)
5	CA=1.5 H_2			
6	CA=NIL (Vacuum)			
7				
8				
9				
10				
11			CA=NIL	
12				
13				
14				
15				
16	CA=1.5(NACE)			
17				
18				CA=NIL (MONEL) OXYGEN
19				
20				
21				CA=0 ALLOY-20 SULPHURIC ACID (WAO UNIT)
32				
33				
35			CA=0 AIR: BIN PURGE, CONVEYING AIR	

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			SUPPLY LLDPE SWING: 4C3	
36			CA=0 RESIN CONVEYING LLDPE SWING: 4C4	
37			CA=0 RESIN GRAVITY FLOW 16HG VAC-30/55PSIG LLDPE SWING: 4C8	
60	CA=0 SS316L-Rich amine with ammonia (LUMMUS PMS CLASS-A24A/B24A)			
99				CA=1.5 ALLOY 400 (LUMMUS PMS CLASS-A1NR)

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE “S” OR “X”) FOR PROJECT DEPENDENT CLASSES.

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TABLE FOR MIDDLE NUMBER

Middle Number	Hastelloy / Inconel / Incoloy Q	PVC / FRP S	LINED STEEL Y	HDPE / PVDF / TEFLON Z
1	CA=NIL (INCONEL 600)	CA=NIL (PVC)	CA = NIL (TEF LINED)	CA=NIL (HDPE) H_2SO_4
2		CA=1.5 (PVC / FRP)		
3	CA = NIL (INCOLOY 800)	CA=NIL (FRP)	CA = NIL (RUBBER LINED - SOFT)	
4	CA = 1.5 (INCOLOY 800)		CA = NIL (RUBBER LINED – SEMI HARD) 30% HCL	CA = NIL (HDPE) 30% HCL
5			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) CAT 'D' SEA WATER	CA = NIL (HDPE) 50% HF
6	CA = 1.5 (INCOLOY 800H)			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	CA=0 (INCONEL 600) HIGH PRESSURE STEAM-IBR (WAO UNIT)		CA=0 CS+PTFE LINED (WAO UNIT)	
21	CA=0 (INCONEL 600) SPENT	CA=NIL (CPVC)	CA=0 PTFE Lined CS Catalyst Chemicals LLDPE SWING: 72C1	

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	CAUSTIC (WAO UNIT)			
33			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) FIRE WATER (SEA)	

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE "S" OR "X") FOR PROJECT DEPENDENT CLASSES.

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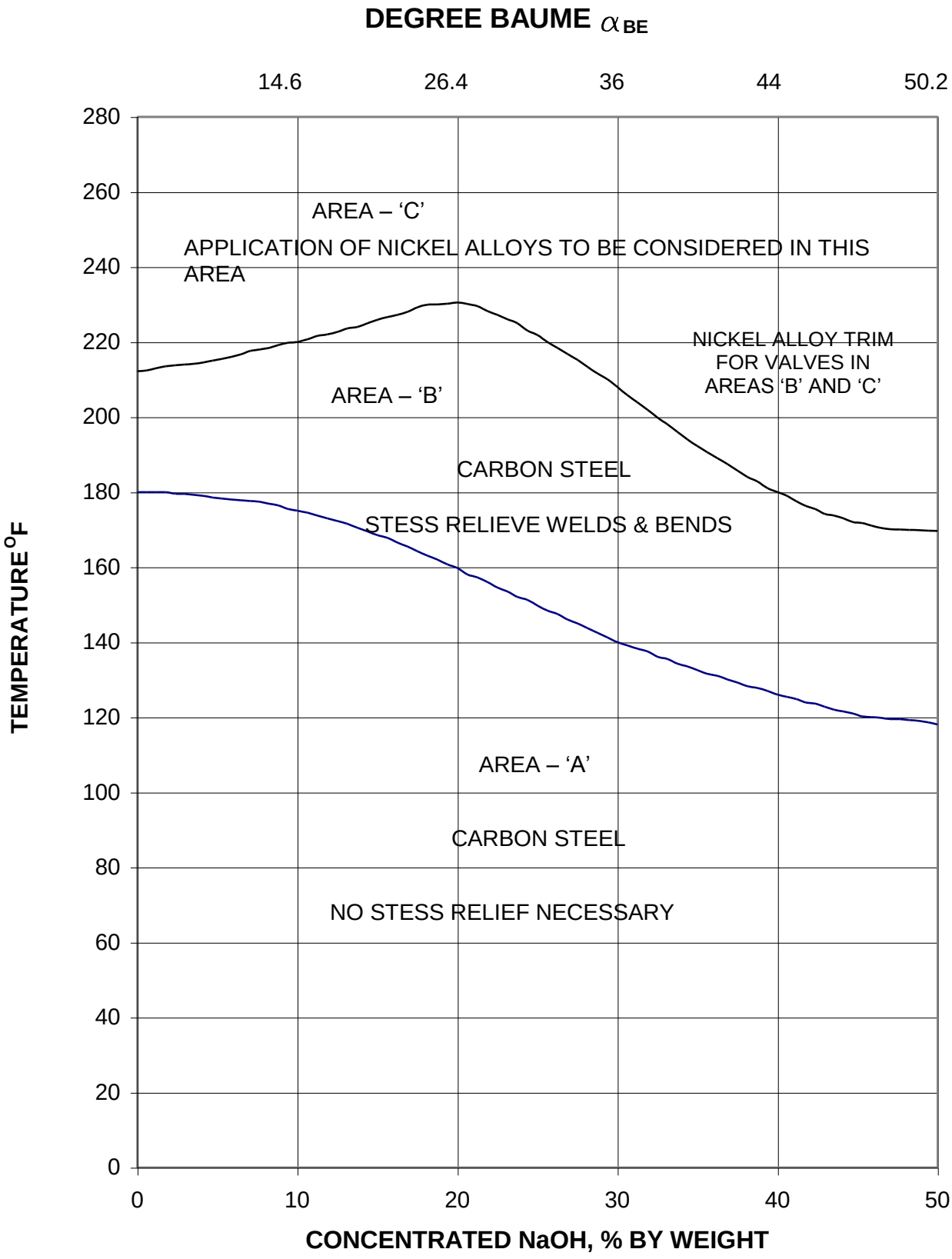
TABLE FOR PRESSURE TEMPERATURE RATING FOR BALL, PLUG & BUTTERFLY VALVES

ITEM	PRESSURE RATING (PIPING CLASS)	SIZE RANGE (NB INCHES)	PRESSURE IN kg / cm^2								
			TEMPERATURE IN ^{O}C								
			-29 TO 38	50	65	100	120	150	175	204	>204
BALL (RPTFE/PTFE Seated)	150# (AS PER PMS)	Upto 16”	19.99	19.58	19.2	17.93	17.2	16.12	15.22	7.03	DO NOT USE
	300# (AS PER PMS)		52.00	51.02	49.8	41.85	37.3	27.4	19.15	7.03	
	600# (AS PER PMS)		104.1	98.46	91.4	64.61	49.3	38.6	29.68	17.6	
PLUG (RPTFE/PTFE Seated)	150# (AS PER PMS)	Upto 8”	19.33	19.3	18.63	17.6	16.89	15.82	14.93	14.06	
	300# (AS PER PMS)		52.02	50.35	48.26	43.4	40.0	37.4	35.23	28.1	
PLUG (Lubricated)	150# (AS PER PMS)	Upto 12”	19.99	19.58	19.12	18.05	17.28	16.12	15.15	14.28	
	300# (AS PER PMS)		52.0	51.1	49.96	47.3	46.82	46.1	45.5	44.6	
	600# (AS PER PMS)		104.1	102.2	99.95	94.7	93.74	92.3	91.1	89.4	
Butterfly (Soft Seat)	150# (A3A, A5Y)	Upto 48”	10.55	10.55	10.55	DON’T USE					DO NOT USE
	150# (A33A, A33Y)		16	16	16						
	150# (RPTFE/PTFE Seat)		19.99	19.58	19.2	17.93	17.20	16.12	15.22	7.03	

NOTE: IF THE CLASS PRESSURE / TEMPERATURE IS LOWER THAN THIS TABLE, CLASS PRESSURE / TEMPERATURE TO BE FOLLOWED.

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CAUSTIC SODA SERVICE GRAPH



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ANNEXURE - II (TO PMS)

PIPING MATERIAL SPECIFICATION EXTRACTS

Client : BPCL

Project : MPMC & EPCM-1 FOR BPREP

Location : BINA, MADHYA PRADESH

Job No. : B957

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	28/02/2025	ISSUED FOR ENGINEERING	SV/SRG	PK	SNH

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Abbreviations:

PMS : Piping Material Specifications.

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CONTENTS

Sl. No.	Description	Pages
1.	Piping Material Specification Extracts, (B957-6-44-0005-A2) Rev.0 Annexure - II	38

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

INDEX OF SPECIFICATIONS

A11A	REV 0	, A19A	REV 0	, A1A	REV 0	, A1D	REV 0	,
A1K	REV 0	, A1N	REV 0	, A20K	REV 0	, A21A	REV 0	,
A21K	REV 0	, A21P	REV 0	, A21Y	REV 0	, A23K	REV 0	,
A24A	REV 0	, A24K	REV 0	, A27K	REV 0	, A28K	REV 0	,
A28M	REV 0	, A2A	REV 0	, A32A	REV 0	, A34M	REV 0	,
A35L	REV 0	, A35M	REV 0	, A36L	REV 0	, A37K	REV 0	,
A37L	REV 0	, A3A	REV 0	, A3K	REV 0	, A40A	REV 0	,
A41A	REV 0	, A41K	REV 0	, A42A	REV 0	, A42K	REV 0	,
A43A	REV 0	, A44A	REV 0	, A44K	REV 0	, A45A	REV 0	,
A45K	REV 0	, A46A	REV 0	, A4A	REV 0	, A60K	REV 0	,
A61A	REV 0	, A62A	REV 0	, A69M	REV 0	, A6K	REV 0	,
A71A	REV 0	, A81A	REV 0	, A81K	REV 0	, A82A	REV 0	,
A83A	REV 0	, A88A	REV 0	, A8A	REV 0	, A91A	REV 0	,
A92K	REV 0	, A94A	REV 0	, A94M	REV 0	, A95A	REV 0	,
A96A	REV 0	, A97A	REV 0	, A99A	REV 0	, A9A	REV 0	,
B1A	REV 0	, B1K	REV 0	, B20D	REV 0	, B20K	REV 0	,
B20Y	REV 0	, B21A	REV 0	, B21P	REV 0	, B21Q	REV 0	,
B24A	REV 0	, B27A	REV 0	, B28A	REV 0	, B2A	REV 0	,
B40A	REV 0	, B41A	REV 0	, B41K	REV 0	, B42A	REV 0	,
B42K	REV 0	, B43A	REV 0	, B43K	REV 0	, B44A	REV 0	,
B44K	REV 0	, B45A	REV 0	, B45K	REV 0	, B46A	REV 0	,
B46K	REV 0	, B47A	REV 0	, B48A	REV 0	, B4A	REV 0	,
B4D	REV 0	, B52A	REV 0	, B55A	REV 0	, B5A	REV 0	,
B60K	REV 0	, B61A	REV 0	, B62A	REV 0	, B69M	REV 0	,
B81A	REV 0	, B82A	REV 0	, B84A	REV 0	, B86A	REV 0	,
B88A	REV 0	, B89A	REV 0	, B92K	REV 0	, B99A	REV 0	,
B9A	REV 0	, D1A	REV 0	, D1K	REV 0	, D20K	REV 0	,
D20Q	REV 0	, D21K	REV 0	, D23F	REV 0	, D23M	REV 0	,
D28A	REV 0	, D2A	REV 0	, D2D	REV 0	, D34K	REV 0	,
D36A	REV 0	, D36K	REV 0	, D40A	REV 0	, D41K	REV 0	,
D42A	REV 0	, D42K	REV 0	, D4A	REV 0	, D54K	REV 0	,
D55A	REV 0	, D5A	REV 0	, D69M	REV 0	, D81K	REV 0	,
D9A	REV 0	, F22A	REV 0	, F25A	REV 0	, F29K	REV 0	,
F2A	REV 0	, F2G	REV 0	, F36A	REV 0	, F36K	REV 0	,
F55K	REV 0	, F81A	REV 0	, F92K	REV 0	, F9A	REV 0	,
G22G	REV 0	, G2G	REV 0	, J2A	REV 0	, J95A	REV 0	

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A11A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : A672GR.B60 CL.12 (200 BHN M/ FROM 16.000 TO ******
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
MILD SOUR FLARE (NON NACE) - REFER NOTE 34.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A19A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 36.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NONNACE MILD CORROSIVE SOUR & AMINE - STRESS RELIEVED; NON NACE SOUR FLARE.

CAUSTIC (STRESS RELIEVED ZONE)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
PLUG	00.500	24.000
BTRFLY	03.000	36.000

PIPING MATERIAL CLASS : A1A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NON CORROSIVE/ FLAMMABLE / NON FLAMMABLE/ NON LETHAL -PROCESS & HYDROCARBONS; FUEL GAS,HYDROCARBON FLARE ; LUBE OIL BEFORE FILTER; AMMONIA, STEAM & CONDENSATE (NON IBR); UTILITIES- INST AIR(BEYOND A3A IN OFFSITES DISTRIBUTION), OWS (PRESSURIZED), PLANT AIR, NITROGEN, CARBONDIOXIDE, ; WATER - BEYOND A3A, DECOKING AIR, MINERAL OIL, PROCESS AIR, REGENERATION NITROGEN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	36.000
BTRFLY	03.000	48.000

PIPING MATERIAL CLASS : A1D REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.38	20.38	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NON CORROSIVE HYDROCARBON & PROCESS SERVICES. FLAMMABLE & NON-LETHAL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A1K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
PURE NON CORROSIVE OR MILD CORROSIVE HYDROCARBONS FLAMMABLE/NON FLAMMABLE & NON LETHAL HYDROCARBONS, LUBE OIL (AFTER FILTERS), CHEMICALS ETC., NITROGEN, INSTRUMENT AIR(BEYOND CAT-'D' WITHIN UNITS & OFFSITE PACKAGES)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A1N REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP316L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP316L FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.24	10.54	9.84	8.78	7.73

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE/NON FLAMMABLE & NON LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A20K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 03.000

Temp (deg. C)	- 48.0	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	19.30	19.30	19.30	16.20	14.40

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP09)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.750	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A21A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	20.00	20.00	18.30	16.20	10.50

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP01)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A21K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000

Temp (deg. C)	- 29.0	- 29.0	38.0	93.0	149.0	204.0	260.0	260.0	270.0
Press (Kg/sq. cm g)	19.30	- 0.60	19.30	16.20	14.40	13.40	- 0.60	12.00	11.50

SERVICE :
CHEMICALS; VENTS (BASED ON LICENSOR PMS CLASS - L7C8F)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
CHECK	00.750	08.000
BALL	00.750	08.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A21P REV : 0 GASKET MATERIAL : SP.WND UNS N08020+PTFE
PIPE MATERIAL : ASTM B 729 ANNLD (UNS N080 FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	20.39	20.39	18.28	16.17

SERVICE :
SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500
BALL	00.500	01.500

PIPING MATERIAL CLASS : A21Y REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	17.57	17.57	16.52	15.11

SERVICE :
CATALYST CHEMICALS (REFER LICENSOR PMS CLASS - 72C1)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A23K REV : 0 GASKET MATERIAL : WHITE SILICON RUBBER
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 36.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	65.0	110.0	110.0	190.0
Press (Kg/sq. cm g)	- 0.50	3.16	3.50	- 0.50	3.16	3.50

SERVICE :
RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - L7A1)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A24A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	- 1.00	20.00	20.00	18.30	16.20	14.10	12.00

SERVICE :
HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP08)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	01.500
BALL	00.750	20.000
BTRFLY	03.000	24.000

PIPING MATERIAL CLASS : A24K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.30	19.30	16.20	14.40	10.50

SERVICE :
CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE (BASED ON LICENSOR PMS CLASS - LGP41)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	24.000
CHECK	00.750	24.000
BALL	00.750	24.000
PLUG	00.750	18.000
BTRFLY	03.000	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A27K REV : 0 GASKET MATERIAL : WHITE NEOPRENE
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 14.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	177.0
Press (Kg/sq. cm g)	10.50	10.50

SERVICE :
DENSE/DILUTE PHASE CONVEYING; ADDITIVE CONVEYING (BASED ON LICENSOR PMS CLASS - 7C50)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	04.000
MISC	02.000	14.000

PIPING MATERIAL CLASS : A28K REV : 0 GASKET MATERIAL : EPDM WHITE (SHORE A-60)
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 12.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	110.0	115.0	
Press (Kg/sq. cm g)	19.30	19.30	15.60	15.50	

SERVICE :
RESIN CONVEYING / DILUTE PHASE / PELLETS (BASED ON LICENSOR PMS CLASS - LC52)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.750	03.000
MISC	02.000	12.000

PIPING MATERIAL CLASS : A28M REV : 0 GASKET MATERIAL : EPDM WHITE (SHORE A-60)
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A358 TP316/316L CL.1 DU FROM 10.000 TO 24.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	38.0	82.0	121.0	121.0
Press (Kg/sq. cm g)	10.50	- 0.60	10.50	10.50	- 0.60	3.90

SERVICE :
RESIN CONVEYING GRAVITY FLOW (BASED ON LICENSOR PMS CLASS - LGP40)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
BALL	00.500	04.000
BTRFLY	02.000	24.000
MISC	02.000	24.000

PIPING MATERIAL CLASS : A2A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	280.0	300.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	11.19	10.44	7.73

SERVICE :
STEAM (IBR), BOILER FEED WATER (IBR) & CONDENSATE (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	36.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	01.500
PISTON	00.500	01.000

Package : IPMCS
Report No. : 56

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Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A32A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	280.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	11.19

SERVICE :
NONIBR STEAM TRACING (BEYOND STEAM SUPPLY MANIFOLD ISOLATION VALVES),NONIBR TRACER CONDENSATE. IN CASE PRES-INSULATED TUBING IS TO BE USED, THIS SPEC SHALL BE USED ONLY FOR TRACING ALONG CS TRACED PIPING.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	01.500
CHECK	00.250	24.000
BALL	00.500	03.000
PISTON	00.500	01.000

PIPING MATERIAL CLASS : A34M REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	121.0
Press (Kg/sq. cm g)	175.70	175.70	126.50

SERVICE :
CHEMICALS (BASED ON LICENSOR PMS CLASS - 6G71)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.000
GLOBE	00.250	01.000
CHECK	00.250	01.000
BALL	00.250	01.000

PIPING MATERIAL CLASS : A35L REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
AIR: BIN PURGE, CONVEYING AIR SUPPLY (BASED ON LICENSOR PMS CLASS - 4C3)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A35M REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 46.0	- 29.0	107.0
Press (Kg/sq. cm g)	175.70	196.80	196.80

SERVICE :
ADDITIVES (BASED ON LICENSOR PMS CLASS - 6G73)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.250	00.750
CHECK	00.250	00.750
BALL	00.250	00.750
NEEDLE	00.250	00.750

PIPING MATERIAL CLASS : A36L REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
RESIN CONVEYING (BASED ON LICENSOR PMS CLASS - 4C4)

VALVE DETAILS

TYPE	FROM	TO

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A37K REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 46.0	260.0	400.0
Press (Kg/sq. cm g)	175.76	175.76	10.54

SERVICE :
ALL PURPOSE (BASED ON LICENSOR PMS CLASS - 6G69)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.125	01.000
CHECK	00.125	01.000
BALL	00.125	01.000
NEEDLE	00.125	00.750

PIPING MATERIAL CLASS : A37L REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - 4C8)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A3A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 FROM 16.000 TO 96.000

Temp (deg. C)	0.0	38.0	50.0	65.0	100.0	150.0	186.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55	10.55	10.55	10.55

SERVICE :
NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DIOXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR), CRWS/ SS/ VENT (A/G). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	48.000
BALL	00.500	16.000
BTRFLY	03.000	48.000

PIPING MATERIAL CLASS : A3K REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	0.0	38.0	93.0	149.0	186.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55	10.55

SERVICE :
DEMINERALISED WATER (OUTSIDE DM PLANT BATTERY LIMITS), POLISHED WATER, POLISHED CONDENSATE, DM WATER BEYOND CATEGORY - 'D', NITROGEN, INSTRUMENT AIR(WITHIN UNITS & OFFSITE PACKAGES) - CATEGORY 'D'

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

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PIPING MATERIAL CLASS : A40A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06	11.94

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETC., DRY FLARE, LIQUID DRAIN, PROPYLENE REFRIGERANT, ETHYLENE REFRIGERANT

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A41A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
CLEAN HYDROCARBONS VAPOR/LIQUID, OFF GAS, N-HEXANE/C6, BUTENE VAPOR, NITROGEN, LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	14.000
GLOBE	00.250	14.000
CHECK	00.250	14.000
BALL	00.500	18.000

PIPING MATERIAL CLASS : A41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 30.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 196.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS & HYDROCARBON SERVICES BELOW MINUS 45 DEG C - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL- LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
CLEAN HYDROCARBONS (MIXTURE ETHYLENE / BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) - 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

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PIPING MATERIAL CLASS : A42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 30.000

Temp (deg. C)	- 110.0	38.0	93.0	149.0	204.0	260.0	260.0
Press (Kg/sq. cm g)	19.30	19.30	16.20	14.40	13.40	12.00	- 0.60

SERVICE :
HYDROCARBONS - FLARE (BASED ON LICENSOR PMS CLASS - LC62)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	14.000
GLOBE	00.750	04.000
CHECK	00.750	04.000

PIPING MATERIAL CLASS : A43A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A44A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A44K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

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PIPING MATERIAL CLASS : A45A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A45K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A46A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM, PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A4A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, VENTS(HIGH TEMPERATURE) ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
BTRFLY	03.000	36.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A60K REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.30

SERVICE :
RICH AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A61A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 30.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
AMINE, SOUR HYDROCARBONS (H2S), SOUR WATER, STABILIZER COLUMN OVERHEAD (H2S ENVIRONMENT), ACID FLARE, METHANOL, AMINE CLOSED BLOWDOWN(MED).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	30.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A62A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 06.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	30.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A69M REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.52	15.11	13.71

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

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Client : BPCL	**Dept./Sect.** 16/43
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PIPING MATERIAL CLASS : A6K REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304L CL.1 FROM 10.000 TO 24.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.24	10.54	9.84	8.78	7.73

SERVICE :
CORROSIVE PROCESS SERVICE - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL - FLARE GAS, ACID GAS WITH CONDENSATE, REFLUX, CORROSIVE WATER, RICH AMINE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A71A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 52.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
BT EXTRACTION W/FV

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	42.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A81A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	165.0	177.0
Press (Kg/sq. cm g)	20.03	20.03	18.27	16.17	14.06	7.03

SERVICE :
ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1C17)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A81K REV : 0 GASKET MATERIAL : SS 316+GRAFIL+SS 316 I-RING

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 03.000

Temp (deg. C)	- 40.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.30	19.30	16.17	14.41	13.35

SERVICE :
ALKYL (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 3/4 INCH SIZES MAXIMUM.) (BASED ON LICENSOR PMS CLASS - 7C28)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	06.000

PIPING MATERIAL CLASS : A82A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	165.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06

SERVICE :
SOLIDS CONVEYING (BASED ON LICENSOR PMS CLASS - 1C14)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	03.000

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Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A83A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	65.0	93.0
Press (Kg/sq. cm g)	20.03	20.03	19.17	18.28

SERVICE :
SULFURIC ACID (93 ~ 98% CONCENTRATION, MAX. VELOCITY 0.9 M/S)

VALVE DETAILS

TYPE	FROM	TO
GATE	02.000	24.000
GLOBE	02.000	16.000
CHECK	02.000	24.000

PIPING MATERIAL CLASS : A88A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
CYCLIC PRESSURE;HYDROCARBONS (BASED ON LICENSOR PMS CLASS - 1C11)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	24.000
CHECK	00.750	18.000

PIPING MATERIAL CLASS : A8A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 06.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	20.03	20.03	19.17

SERVICE :
SULPHURIC ACID (80-98% CONC.) - TOXIC BUT NON LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000
BALL	00.500	06.000
PLUG	00.500	06.000

PIPING MATERIAL CLASS : A91A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO ******
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55

SERVICE :
COOLING WATER, RAW WATER, SERVICE WATER (UNDER GROUND) CATEGORY "D"

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	48.000
BALL	00.500	16.000
BTRFLY	03.000	48.000

Package : IPMCS
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Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A92K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35

SERVICE :
LUBE OIL, SEAL OIL, TRUE INHIBITOR DNBP, TBC, AKOH SOLUTION, PHOSPHATE, DMDS INJECTION, DEMINERALIZED WATER(BEYOND CATEGORY 'D').

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A94A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 FROM 16.000 TO 48.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90	18.90

SERVICE :
FIRE WATER-FRESH WATER (ABOVE GROUND)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A94M REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 312 TP316 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	65.0
Press (Kg/sq. cm g)	9.00	9.00	9.00

SERVICE :
CONCENTRATE FOAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000
BALL	00.500	08.000

PIPING MATERIAL CLASS : A95A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO 36.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	1.03	1.03	1.03	1.03

SERVICE :
CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	48.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BTRFLY	03.000	48.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A96A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55

SERVICE :
CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A97A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO 36.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90	18.90

SERVICE :
FIRE WATER- FRESH WATER (UNDER GROUND)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A99A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	60.0	93.0	149.0
Press (Kg/sq. cm g)	20.03	20.03	19.33	18.28	16.17

SERVICE :
CAUSTIC SERVICE, SODIUM HYDROXIDE, HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 30 WT% AT MAX. TEMPERATURE 60 DEG. C, 40 WT% AT MAX. TEMPERATURE 50 DEG.C, AND 50 WT% AT MAX. TEMPERATURE 45 DEG.C), CAUSTIC BLOWDOWN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A9A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO ******

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE / NON FLAMMABLE & NON LETHAL - HVGO,VGO,RCO,SLOP,VR,VGO,CAUSTIC (NO STRESS RELIEF ZONE), BENZENE, CGC AREA CBD, DEBUTANIZER AREA CBD, PGH AREA CBD, QUENCH WATER DRAIN, QUENCH OIL BLOW DOWN, AROMATIC CLOSED DRAIN, CLOSED SOLVENT DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B1A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - HYDROCARBONS, AROMATICS, AMMONIA, SWEET GAS, FLUSHING OIL AND OTHER UTILITIES -MP CONDENSATE, INSTRUMENT AIR(OFFSITES), PLANT AIR, NITROGEN, AMMONIA GAS, NITROGEN-HIGH TEMPERATURE ETC. ABOVE CLASS 'A1A'.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B1K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/ NON FLAMMABLE & NON LETHAL HYDROCARBONS, CHEMICAL, LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B20D REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 20.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49	15.11	14.72

SERVICE :
HP STEAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : B20K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	50.60	50.60	40.10	26.70

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP27)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B20Y REV : 0

GASKET MATERIAL : GARLOCK STYLE 3540/GORETEX GR
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B(PTFE LINED) FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05

SERVICE :
SPENT CAUSTIC, SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B21A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.00	52.00	40.10	26.70	13.40

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP16)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B21P REV : 0 GASKET MATERIAL : SP.WND UNS N08020+PTFE+I RING
PIPE MATERIAL : ASTM B 729 ANNLD (UNS N080 FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.73	52.73	52.02	49.91	47.81

SERVICE :
SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500
BALL	00.500	01.500

PIPING MATERIAL CLASS : B21Q REV : 0 GASKET MATERIAL : UNS N06600+VRMICULITE+N06600IR
PIPE MATERIAL : ASTM B 167 (UNS N06600) FROM 00.500 TO 03.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	51.32	49.56	46.75

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500

PIPING MATERIAL CLASS : B24A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.00	52.00	47.50	46.00	44.60	42.20

SERVICE :
HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP21)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	16.000
GLOBE	00.750	10.000
BALL	00.750	08.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B27A REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.00	52.00	47.50	46.00	44.60

SERVICE :
PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) (BASED ON LICENSOR PMS CLASS - LPZ18)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	16.000
GLOBE	00.750	12.000
CHECK	00.750	16.000
BALL	00.750	16.000
BTRFLY	06.000	16.000

PIPING MATERIAL CLASS : B28A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	46.70	46.70	46.70	46.00	44.60

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - LGP24)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	48.000
GLOBE	00.500	12.000
CHECK	00.500	48.000
BALL	00.500	24.000

PIPING MATERIAL CLASS : B2A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 30.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
SBOILER BLOWDOWN, LP BOILER FEED WATER, MP STEAM, MP CONDENSATE-ALL IBR

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PISTON	00.500	01.000

PIPING MATERIAL CLASS : B40A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 72.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23	41.13

SERVICE :
NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -47 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETHYLENE ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B41A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 18.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
CLEAN HYDROCARBONS VAPOR/LIQUID OFF GAS
N-HEXANE/C6, BUTENE VAPOR, NITROGEN , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	18.000
GLOBE	00.250	12.000
CHECK	00.250	18.000
BALL	00.500	18.000

PIPING MATERIAL CLASS : B41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 42.000

Temp (deg. C)	- 196.0	38.0	93.0	120.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	40.14

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL-LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
CLEAN HYDROCARBONS (MIXTURE EHYLENE/BUTENE)
AT LOW TEMPERATURE (OR RISK OF LOW TEMP)
- 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 12.000
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000

Temp (deg. C)	- 110.0	- 101.0	38.0	93.0	149.0	180.0	204.0	260.0	316.0	343.0
Press (Kg/sq. cm g)	49.90	50.60	50.60	42.20	38.00	36.20	34.80	32.60	30.90	30.20

SERVICE :
HYDROCARBONS-LIQUID / VAPOR; LOW TEMPERATURE AND HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASSES - LGP45 & L6E57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000
CHECK	00.750	12.000
BALL	00.750	06.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B43A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY) AT LOW TEMPERATURE
(OR RISK OF LOW TEMP) - 45°C MINIMUM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B43K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 12.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 110.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0
Press (Kg/sq. cm g)	49.91	49.91	43.59	37.37	36.20	33.74	31.63	31.28

SERVICE :
HYDROCARBONS:LOW TEMPERATURE & HIGH TEMPERATURE (BASED ON
LICENSOR PMS CLASS - 6E57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	12.000
GLOBE	00.750	12.000
CHECK	00.500	12.000
BALL	01.000	12.000

PIPING MATERIAL CLASS : B44A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B44K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B45A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 20.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
HC SLURRY (POLYMER + CATALYST):- PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B45K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B46A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) -45°C MINIMUM PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B46K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 12.000

Temp (deg. C)	- 46.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	50.60	50.60	40.10	26.70	10.50

SERVICE :
PRODUCT DISCHARGE (BASED ON LICENSOR PMS CLASS - LGP44)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000
BALL	00.750	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B47A REV : 0

GASKET MATERIAL : SP.WND SS316+PTFE+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 20.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 01.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 01.500 TO 14.000

Temp (deg. C)	- 46.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	50.62	50.62	43.59	39.37	36.20	33.74

SERVICE :
HYDROCARBONS, HP NITROGEN, RECOVERED GAS (BASED ON LICENSOR PMS CLASS - 2E63 & 2E18).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	20.000
GLOBE	00.500	12.000
CHECK	00.500	20.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B48A REV : 0

GASKET MATERIAL : SP.WND SS316+PTFE+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 333 GR.6 FROM 01.500 TO 03.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 01.000

Temp (deg. C)	- 40.0	38.0	93.0	149.0	177.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	17.57	10.54

SERVICE :
CONVEYING SOLIDS (BASED ON LICENSOR PMS CLASS - 2E65)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	03.000

PIPING MATERIAL CLASS : B4A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 24.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B4D REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO ******

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49	15.11

SERVICE :
NON CORROSIVE HYDROCARBONS ABOVE 454 DEG C
- FLAMMABLE & NON LETHAL- HIGH TEMPERATURE TRANSFER LINES.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B52A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	43.66

SERVICE :
HYDROGEN (FEED & PRODUCT)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
BTRFLY	03.000	24.000

PIPING MATERIAL CLASS : B55A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0
Press (Kg/sq. cm g)	52.00	52.00	47.80

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP57)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.500	02.000
CHECK	00.500	02.000

PIPING MATERIAL CLASS : B5A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	43.66

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE, TOXIC/NON-TOXIC BUT NON-LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B60K REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 04.000

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	42.18	42.18	35.85	31.99	29.52

SERVICE :
RICH AMINE, RICH AMINE WITH FLASHING H2S.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B61A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53

SERVICE :
NACE CORROSIVE, FLAMMABLE AND NONLETHAL SOUR SERVICES (STRESS RELIEVED)
- SOUR WATER, AMINE, SOUR HYDRO CARBONS(H2S), METHANOL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B62A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 06.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53

SERVICE :
AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B69M REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	50.50	50.50	43.59	39.37	36.20	33.74

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

PIPING MATERIAL CLASS : B81A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	66.0	93.0	110.0	149.0
Press (Kg/sq. cm g)	52.02	52.02	49.70	47.45	47.03	46.05

SERVICE :
ALKYLS,ADDITIVES & CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1E20)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B82A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 04.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	66.0	93.0	149.0	177.0
Press (Kg/sq. cm g)	45.69	45.69	42.18	33.74	16.87	7.03

SERVICE :
COVEYING SOILDS (BASED ON LICENSOR PMS CLASS - 1E23)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B84A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	29.87	29.87	29.87	29.87	29.87

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E22)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.500	12.000
CHECK	00.750	24.000
BALL	00.750	10.000

PIPING MATERIAL CLASS : B86A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64

SERVICE :
REACTOR PRODUCT DISCHARGE-PRODUCT CONVEYING (BASED ON LICENSOR PMS CLASS - 1E64)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	00.750
BALL	00.500	08.000

PIPING MATERIAL CLASS : B88A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 12.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.45	46.05	44.64	42.18

SERVICE :
CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - 1E18)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.500	12.000
CHECK	00.750	12.000
BALL	00.750	01.000

PIPING MATERIAL CLASS : B89A REV : 0 GASKET MATERIAL : 316S.S. 3-PLY CORRUGTED GASKET

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 24.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 30.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	165.0
Press (Kg/sq. cm g)	47.45	47.45	45.34

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E87)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.750	24.000
BALL	00.750	10.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B92K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80

SERVICE :
LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B99A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0
Press (Kg/sq. cm g)	52.02	52.02	47.80

SERVICE :
CAUSTIC (STRESS RELIEVED ZONE), SODIUM HYDROXIDE HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 20%~50% AT TEMP. 93 DEG.C ~ 45 DEG.C)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : B9A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 66.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, ETC. HYDROCARBON,QUENCH OIL, PROCESS WATER, FUEL OIL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : D1A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABL AND NON LETHAL - PETROLEUM PRODUCTS: FO. FG, SWEET GAS, INHIBITOR SOLUTION, NH3, BRINE (MINUS 10 DEG C), CO2, CAUSTIC SODA (20 BE MAX & TEMP 70 DEG C MAX), PARAXYLENE, BITUMEN, ETHYLENE, DONOR, VAPORIZED PROPYLENE, HIGH PRESSURE PURIFIED NITROGEN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D1K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
ANSI RATING : 600 PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	101.24	101.24	84.36	75.57	69.95	65.38	62.21	60.80	59.40	57.99	56.94	55.54

SERVICE :
PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON
- FLAMMABLE/NON-FLAMMABLE & NON-LETHAL HYDROCARBONS, CHEMICALS ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : D20K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	101.30	101.30	85.20	75.60

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - L7E28)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : D20Q REV : 0 GASKET MATERIAL : UNS N06600+VRMICULITE+N06600IR
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM B 167 (UNS N06600) FROM 00.500 TO 03.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	105.46	105.46	105.46	102.30	99.13	93.51	85.07	82.61	79.80	74.87	71.36	68.55	63.27	50.97	33.74

SERVICE :
HIGH PRESSURE STEAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500

PIPING MATERIAL CLASS : D21K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	101.20	101.20	87.20	78.70	72.10	67.10	63.30	62.60	61.20	60.10	59.40

SERVICE :
HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - L7G7)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
GLOBE	00.750	08.000
CHECK	00.750	08.000
BALL	00.750	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D23F REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 04.50 MM
PIPE MATERIAL : ASTM A 691 GR5CR CL.42 FROM 16.000 TO 64.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 335 GR.P5 FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	550.0
Press (Kg/sq. cm g)	105.45	105.45	103.34	98.42	93.85	90.68	85.06	82.60	79.79	74.86	71.35	68.54	52.37	38.66	28.12	24.58

	575.0	600.0	625.0	650.0
	17.95	12.34	8.16	4.79

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES - FLAMMABLE & NON-LETHAL- CRUDE OIL, RCO, LVGO, HVGO, VB, TAR, VACUUM RESIDUE, TRANSFER LINES, FUEL OIL, DIESEL, HYDROCARBONS, HIGH TEMPERATURE TRANSFER LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D23M REV : 0

GASKET MATERIAL : SP.WND SS321+GRAFIL+I RING
CORROSION ALLOWANCE : 00.00 MM
PIPE MATERIAL : ASTM A 358 TP321 CL.1 FROM 10.000 TO 14.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 312 TP321 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	101.23	101.23	91.04	83.66	77.68	72.41	68.54	66.78	65.38	64.32	63.27	62.91	62.21	54.48	50.96

SERVICE :
CORROSIVE LIQUID, VAPOUR AND GAS - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL, HYDROGENATION, PYROLYSIS GAS, SECOND STAGE REACTOR

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D28A REV : 0

GASKET MATERIAL : SS 316L
CORROSION ALLOWANCE : 01.50 MM
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 08.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	104.00	94.90	92.10	88.90	84.40	77.00	75.60	74.50

SERVICE :
CYCLE GAS; CYCLIC SERVICE; NITROGEN; (BASED ON LICENSOR PMS CLASS - LPZ04)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
GLOBE	00.750	08.000
CHECK	01.500	08.000
BALL	00.750	06.000
BTRFLY	03.000	08.000

PIPING MATERIAL CLASS : D2A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
STEAM (IBR), STEAM CONDENSATE(IBR), BOILER FEED WATER (IBR), HP STEAM(IBR), HP CONDENSATE (IBR).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D2D REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 24.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	105.46	105.46	105.46	101.59	97.37	93.50	85.07	82.61	79.79	74.87	71.36	68.55	63.27	44.99	30.23

SERVICE :
STEAM (IBR) ABOVE 454 DEG C

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D34K REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	66.40	66.40	66.40	52.70

SERVICE :
PROCESS TUBING - RO, CATALYST BLOW BACK (BASED ON LICENSOR PMS CLASS - LGP55)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : D36A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	104.05	104.05	94.91	89.28	89.28

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS - FLAMMABLE & NON-LETHAL, KILL GAS (BASED ON LICENSOR PMS CLASS - 1G4/1G4A)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D36K REV : 0 GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.750 TO 02.000

Temp (deg. C)	- 101.0	- 29.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0
Press (Kg/sq. cm g)	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - 6G57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	02.000
GLOBE	00.750	02.000
CHECK	00.750	02.000

PIPING MATERIAL CLASS : D40A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 36.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE REFRIGERANT, XYLENE, METHANOL, ETHYLENE REFRIGERANT, NH3, GAS FLARE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 30.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 196.0	38.0	93.0	120.0
Press (Kg/sq. cm g)	101.24	101.24	84.36	80.12

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C

- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : D42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
CLEAN HYDROCARBONS(MIXTURE ETHYLENE/BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) -45 DEG C MINIMUM LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : D42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 12.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	98.40	98.40	87.20	78.70	72.06

SERVICE :
HYDROCARBONS, HP NITROGEN, CYCLIC PRESSURE (BASED ON LICENSOR PMS CLASS L6G5)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000

PIPING MATERIAL CLASS : D4A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 24.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETHYLENE, COMONOMER (1-BUTENE / 1-HEXENE), VENT TO FLARE, RECOVERED GAS, RECOVERED LIQUID ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D54K REV : 0 GASKET MATERIAL : SS304+GRAFIL+SS304 I/O RING
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 04.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 101.0	38.0	65.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	51.70	51.70	58.00	51.70	51.70	51.70	51.70	51.70	51.70	51.70

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LPZ17)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	04.000
GLOBE	00.750	04.000
CHECK	00.750	04.000

PIPING MATERIAL CLASS : D55A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 02.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	94.90	94.90	94.90	92.10	89.30

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP31)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.750	02.000
CHECK	00.750	02.000

PIPING MATERIAL CLASS : D5A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	86.96

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE & NON-LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D69M REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU FROM 00.500 TO 06.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	101.24	101.24	87.18	78.74	72.06	67.14

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000

PIPING MATERIAL CLASS : D81K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 40.0	38.0	66.0	93.0	110.0	149.0
Press (Kg/sq. cm g)	101.24	101.24	92.80	84.37	81.69	75.57

SERVICE :
ALKYL, PRODIGYTM BMC CATALYST, MODIFIER D (BASED ON LICENSOR PMS CLASSES - 7E28 & 7G28).

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D9A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 600

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 30.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 36.000 TO 36.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, PROCESS WET LIQUID DRAIN,.ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : F22A REV : 0 GASKET MATERIAL : SOFT IRON

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : SA-106/SA-106M GR.B FROM 00.500 TO 16.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE :
STEAM, CONDENSATE, BOILER BLOWDOWN, FEEDWATER DISCHARGE AND CHEMICAL FEED TO BOILER ((AS PER ASME SEC-I)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000

PIPING MATERIAL CLASS : F25A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	191.0
Press (Kg/sq. cm g)	260.50	260.50	238.70	229.90	224.60

SERVICE :
CARBON MONOXIDE, REACTION KILL (BASED ON LICENSOR PMS CLASS - LGP36)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	02.000

PIPING MATERIAL CLASS : F29K REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 46.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	175.80	175.80	175.80	175.80

SERVICE :
CHEMICALS (BASED ON LICENSOR PMS CLASS - LC51)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : F2A REV : 0 GASKET MATERIAL : SOFT IRON

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 18.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE :
STEAM AND BOILER FEED WATER (IBR), CONDENSATE (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

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Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : F2G REV : 0

GASKET MATERIAL : 5%CR 0.5%Mo
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A 335 GR.P91 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.P91 CL.42 FROM 16.000 TO 24.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	263.65	263.65	263.65	255.91	248.18	233.77	212.67	206.70	199.67	187.01	178.57	171.19	157.83	135.69	127.95	127.84

SERVICE :
VERY HIGH PRESSURE STEAM (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

PIPING MATERIAL CLASS : F36A REV : 0

GASKET MATERIAL : SOFT IRON
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	196.85	196.85	196.85	196.85	196.85

SERVICE :
KILL GAS (BASED ON LICENSOR PMS CLASS - 1K6)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	02.000
GLOBE	00.500	02.000
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : F36K REV : 0

GASKET MATERIAL : SS 316L
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000

Temp (deg. C)	- 40.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	241.10	241.10	217.60	201.78

SERVICE :
MODIFIER C (BASED ON LICENSOR PMS CLASS - 7K6)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	02.000
GLOBE	00.500	02.000
CHECK	00.500	02.000
BALL	00.500	02.000
NEEDLE	00.500	02.000

PIPING MATERIAL CLASS : F55K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 02.000

Temp (deg. C)	- 40.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	210.90	210.90	177.90	164.20

SERVICE :
HYDROGEN; KILL GAS (BASED ON LICENSOR PMS CLASS - L7K6D)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	02.000
GLOBE	00.750	02.000
CHECK	00.750	02.000

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Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : F81A REV : 0 GASKET MATERIAL : SOFT IRON
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 1500

Temp (deg. C)	- 29.0	38.0	66.0
Press (Kg/sq. cm g)	175.77	175.77	175.77

SERVICE :
ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1K8)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	01.000
BALL	00.500	01.000

PIPING MATERIAL CLASS : F92K REV : 0 GASKET MATERIAL : SS 316
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 14.000 TO 16.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 1500

Temp (deg. C)	- 29.0	93.3	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	253.09	210.92	189.12	174.71	163.81	155.38	151.86	148.34	145.20	142.72	139.20	136.74	134.28	124.44

SERVICE :
CORROSIVE SERVICE, PHOSPHATE SERVICE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	04.000
CHECK	00.500	16.000

PIPING MATERIAL CLASS : F9A REV : 0 GASKET MATERIAL : SOFT IRON
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 1500

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	237.28	230.61	222.87	210.57	192.29	188.77	187.37	177.17	144.83

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, HYDROCARBON, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

PIPING MATERIAL CLASS : G22G REV : 0 GASKET MATERIAL : 5%CR 0.5%Mo
PIPE MATERIAL : SA-335/SA-335M GR.P91 FROM 00.500 TO 16.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 2500

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	439.40	439.40	439.40	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38	213.02	212.87

SERVICE :
SUPER HIGH PRESSURE STEAM (IBR) & ASME SEC-I

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

PIPING MATERIAL CLASS : G2G REV : 0 GASKET MATERIAL : 5%CR 0.5%Mo
PIPE MATERIAL : ASTM A 335 GR.P91 FROM 00.500 TO 12.000
PIPE MATERIAL : ASTM A 691 GR.P91 CL.42 FROM 16.000 TO 30.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 2500

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	439.40	439.40	439.40	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38	213.02	212.87

SERVICE :
SUPER HIGH PRESSURE STEAM (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

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Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : J2A REV : 0

GASKET MATERIAL : BUTYL RUBBER
PIPE MATERIAL : ASTM A 106 GR.B(GALV) FROM 00.500 TO 12.000

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55

SERVICE :
DRINKING WATER (ABOVE GROUND / UNDER GROUND), FIRE WATER-SPRINKLER SYSTEM U/G ,A/G AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000

PIPING MATERIAL CLASS : J95A REV : 0

GASKET MATERIAL : BUTYL RUBBER
PIPE MATERIAL : IS-3589 GR.410 (GALV) FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B(GALV) FROM 00.500 TO 14.000

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90

SERVICE :
FIRE WATER-SPRINKLER SYSTEM, WATER & FOAM SOLUTION (U/G& A/G) AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM

VALVE DETAILS

TYPE	FROM	TO

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ANNEXURE – I (TO PMS)

JOB
PIPING MATERIAL SPECIFICATION
GENERAL NOTES

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	28.02.2025	ISSUED FOR ENGINEERING	PK	MMK	SNH

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Abbreviations:

AARH	: Arithmetic Average Roughness Height
ANSI	: American National Standards Institute
API	: American Petroleum Institute
ASME	: American Society of Mechanical Engineers
ASTM	: American Society for Testing and Materials
AWWA	: American Water Works Association
BIS	: Bureau of Indian Standards
BSI	: British Standards Institute
BW	: Butt Weld
CA	: Corrosion Allowance
DIN	: Deutsches Institut für Normung
FRP	: Fiber Reinforced Plastic
GOST	: Russian Standard (Gosudarstvennyy Stan dart)
HDPE	: High Density Poly Ethylene
IBR	: Indian Boiler Regulations
JIS	: Japanese Industrial Standards
LTCS	: Low Temperature Carbon Steel
MSS	: Manufacturers Standardization Society
NACE	: National Association of Corrosion Engineers
NDT	: Non Destructive Testing
PMS	: Piping Material Specification
PP	: Poly Propylene
PTFE	: Poly Tetra Flouro Ethylene
PVC	: Poly Vinyl Chloride
PVDF	: Poly Vinylidene Flouride
RTJ	: Ring Type Joint
SW	: Socket Weld

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1.0 SCOPE

1.1 This specification (PMS) covers the various piping classes for Process and utility Piping.

1.2 Deviations from this specification may be necessary to conform to specific job requirements.

1.3 PMS for PPU and LLDPE/HDPE Swing unit shall be read in conjuction with Licensor PMS.

1.4 PMS for PPU has been prepared for the preferred component listed in Licensor PMS. If any special piping components are listed in the Process design package or P&ID, corresponding Licensor class shall be followed for reference.

2.0 REFERRED CODES & STANDARDS

2.1 All Piping shall be designed in accordance with the Process Piping Code, ASME B31.3. A particular edition (indicated in Design Basis), once selected shall be followed throughout the job.

2.2 Editions and addenda (if any) of referred Codes and Standards shall be as per the Job Engineering Design Basis (Piping).

2.3 For the sake of brevity, the initials of the society to which the codes are referred to may be omitted in the specification. For example; B16.5 is a code referring to ASME; A106 is a standard referring to ASTM.

3.0 MATERIAL SPECIFICATIONS

3.1 Individual piping Class has been generally designed to cover a set of services operating within pressure-temperature combination as per ASME B16.5 / B16.34 or part of it.

3.2 The PMS shall be strictly adhered to in the design, requisitioning, purchasing, fabrication and testing of the piping system. However, deviations of material may occur due to design conditions and/or availability. All substitutions must be duly approved.

3.3 Piping components as per “MNF STD” or “Unlisted components as per B31.3” shall be designed and qualified as per clause 304.7.2 for unlisted components.

3.4 For Valves, material requirements specified in Annexure “D’ of API 600 shall be followed.

3.5 Where trim nos. have been specified, the same shall be as per API 600.

3.6 In cases where 'D/t' ratio exceeds 100, components shall be treated as unlisted components and designed according to B31.3. ‘D’ is outer dia. and ‘t’ is nominal thickness for all other components except branches where 't' is minimum thickness as per purchase specification.

3.7 Unless mentioned otherwise, pipe thicknesses in the specs are for above ground piping.

4.0 CLASS DESIGNATION CODE

The class designation shall consist of not more than three components made up of a letter, number & letter; e.g.B1A.

4.1 The first letter indicates pressure rating.

A	150 Class	D	600 Class	G	2500 Class
B	300 Class	E	900 Class	J	125/150 Class
C	400 Class	F	1500 Class	K	UNCLASSIFIED

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4.2 The middle number indicates difference in the specifications within the same rating and material as enlisted in the Table attached.

4.3 The third letter indicates type of material.

A	Carbon
B	Carbon Moly. (This material is not recommended)
C	1.0 % Cr., 0.5 % Moly. (This material is not recommended)
D	1.25 % Cr., 0.5 % Moly.
E	2.25 % Cr., 1.0 % Moly.
F	5.0 % Cr., 0.5 % Moly.
G	9.0 % Cr., 1.0 % Moly.
H	3.5 % Ni.
I	
J	Nickel / Titanum
K	Stainless steel type 304, 304H, 304L.
L	Aluminium
M	Stabilised stainless steel type 321, 347 and Stainless steel type 316, 316H.
N	316L
P	Monel / Alloy 20
Q	Hastalloy / Inconel / Incoloy
R	Lead
S	PVC & FRP, PP / FRP, PVDF / FRP
T	Cast Iron / Silicon Iron
U	
V	Duplex Stainless Steel
W	Cupro-Nickel
Y	Lined steel (Rubber Lined, Teflon Lined, Cement lined etc).
Z	HDPE / PDVF / Teflon / PVC

5.0 PIPES

5.1 Pipe dimension shall be in accordance with ASME B36.10, IS:1239 & IS:3589 for wrought steel and wrought iron pipe; to B36.10 / B36.19 for stainless steel pipe and respective ASTM Standard for non-ferrous and non- metallic pipes.

5.2 Pipe made by acid-bessemer process shall not be acceptable, steel pipe shall be made by open hearth, electric furnace or basic Oxygen process.

5.3 All pipe threads shall conform to ASME B1.20.1 except where otherwise noted.

5.4 Pipe thicknesses not covered in different classes of this specification shall be calculated to meet specific job requirement based on actual max. design condition to economise on thickness. However, in such cases the thickness shall be calculated at not less than 80% of class rating unless defined otherwise in the Job Engineering Design Basis (Piping).

5.5 Maximum of 10% of Corrosion Allowance may be adjusted to optimize on pipe schedule. However, if CA is suffixed by 'minimum', this downward adjustment shall not be used.

5.6 Non-standard pipe sizes 1¼", 2½", 3½", 5" and 22" shall not be treated as a part of this specification unless these sizes are separately called out.

6.0 FLANGES

6.1 Flanges shall be in accordance with the following codes, except where otherwise noted:

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Upto 24" (150# -1500#)	ASME B16.5
Upto 12" , 2500#	ASME B16.5
Above 24"	ASME B16.47 SERIES 'B' / AWWA / EIL' STD.

Flanges to ASME B16.47 SERIES 'A' or any other standard (e.g. DIN, GOST, JIS etc.) may be specified to mate with equipment or valve flanges with the corresponding bolting.

6.2 Finish of steel flange faces shall be as follows:

Stock Finish	:	1000 µin AARH max.
Serrated Finish / 125 AARH / Smooth finish	:	Serrations with 125-250µin AARH
63 AARH	:	32 TO 63 µin AARH

6.3 Brinnel hardness for RTJ groove shall be atleast 20 BHN more than that of corresponding gasket as specified.

6.4 Fig.8 Fl and SPCR & BLN shall be as per B16.48 upto 24" (150-1500#) & upto 12" for 2500#. For other sizes, refer EIL Std 7-44-0162.

7.0 FITTINGS

7.1 Forged steel SW and threaded fittings shall be in accordance with ASME B16.11, unless otherwise specified. For items not covered under B16.11, reference may be made to BS 3799 or appropriate MSS-SP-Std.

7.2 BW Fittings shall be in accordance with ASME B16.9, unless otherwise specified.

7.3 Dimensions of steel BW fittings for sizes not covered in ASME B16.9 shall conform to MSS-SP-48.

7.4 Usage of unions shall be restricted to utilities only.

8.0 BENDS, MITRES AND REDUCERS FABRICATED FROM PIPE

8.1 Mitres and Reducers fabricated from Pipe may be used if specified in particular Piping Class. Mitres require higher thickness than corresponding Pipe / Elbow to hold the same pressure (Refer ASME B31.3).

9.0 GASKETS

9.1 Non-metallic gaskets shall conform to B16.21 (corresponding to B16.5) upto 24", and B16.21 (corresponding to B16.47B) beyond 24", unless otherwise specified.

9.2 Spiral wound gaskets (SP.WND or SPWD) and Ring Joint gaskets shall conform to B16.20.

9.3 Inner rings shall be provided for all Spiral Wound Gaskets. For spiral wound gaskets, material of Inner Compression ring shall be same as Spiral Strip material.

10.0 BOLTING

10.1 All bolts shall conform to B18.2.1, nuts to be B18.2.2. Reference shall also be made to B16.5 for studs.

10.2 Threads shall be to coarse Thread Series, B1.1, having Class 2A allowances for bolts and studs, and Class 2B tolerance for nuts.

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10.3 Nuts for Bolts and Studs shall be the American Standard Hexagon Heavy Series.

10.4 When specified as "GALV.", the studs, M/C bolts and nuts shall be 'hot dip zinc coated' in accordance with requirements of 'class C' of `ASTM A 153'. As an alternative, electrogalvanizing as per IS 1573, 'Service Grade Number 2' is also acceptable. However, for bolting where "HDG" has been specified, only 'hot dip zinc coating' in accordance with requirements of 'class C' of `ASTM A 153' is acceptable.

11.0 THREADS

11.1 Threads for threaded Pipes, Fittings, Flanges and Valves shall be in accordance with B1.20.1 taper threads, unless otherwise specified.

11.2 Upto 204 deg.C, threaded joints shall be made with 1" width PTFE joining tape.

11.3 Above 204 deg.C, threaded joints shall be seal welded with a full strength fillet weld.

11.4 All threaded joints irrespective of pressure and temperature on lines carrying toxic fluid shall be seal welded with a full strength fillet weld.

12.0 VALVES

12.1 Face to Face / End to End dimension of valves shall conform to B16.10 to the extent covered. For valves not covered in B16.10, reference shall be made to BS EN 558-1 for PN Designated Flanged valves, BS EN 558-2 for Class designated Flanged valves and BS EN 12627 for Butt Welding end valves and / or the manufacturer's drawings.

12.2 Flange / weld ends of the valve shall be as per the corresponding Flange / Fitting ends of the piping class, unless otherwise specified.

12.3 Pressure-temperature rating for flanged and butt welding end valves shall be as per ASME B16.34 except for ball, plug & butterfly valves. For these valves refer TABLE FOR PRESSURE-TEMP RATING FOR BALL, PLUG AND BUTTERFLY VALVES. Wall thickness of valve body at different locations should not be less than as calculated as per B16.34.

12.4 Unless called-out specifically, valves shall be as per the following Standards:

Valve	Size	Rating	Des. Std.	Testing Std.
Gate	1/2"- 1-1/2"	800 / 1500	'API 602/ ISO 15761'	API-598
Globe / Check	-do-	800 / 1500	'API 602/ ISO 15761'	API-598
Gate	2"-24"	150 / 300 / 600	'API 600/ ISO 10434'	API-598
Gate	26"-42"	150 / 300	B-16.34	'API 598'/ 'BS EN 12266-1'
Globe	2"-16"	150	BS-1873	'BS EN 12266-1'
Globe	2"-12"	300/600	BS-1873	-do-
Check	2"-24"	-do-	BS-1868	-do-
Gate/ Globe/Check	2"-8"	900 / 1500 / 2500	B-16.34 (Refer 12.6 also)	'API 598' / 'BS EN 12266-1'

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Ball	1/2"-16"	150 / 300 / 600	'BS EN ISO 17292' / 'API 6D'	'BS EN 12266-1' / 'API-598'
Ball	1/2"-8"	900/ 1500	API 6D	API-598
Plug	1/2"-12"	All	'API-599' /'BS 5353'	'API-598' / 'BS EN 12266-1'
Btrfly	3" & above	All	'API-609' / 'BS EN 593' / 'AWWA C504'	'API-598' /' BS EN 12266-1'/ 'AWWA'
Diaphram	ALL	-	BS-5156	'BS EN 12266-1'
Bronze			RELEVANT IS STD.	RELEVANT IS STD.
Cast Iron			RELEVANT IS STD.	RELEVANT IS STD.

12.5 If not covered in 12.3, the valve shall be as per B16.34 / relevant MSS-SP Standard.

12.6 For details of the valves specifications, refer specifications 6-44-0006. Features not covered by 6-44-0006 and the relevant code shall be to the manufacturer's standard.

12.7 Unless otherwise specifically called for, upto 600# rating, 2" and larger size steel Gate, Globe & Check valves in Hydrocarbon and utility service shall have bolted bonnets. Pressure-seal bonnets or covers shall be used for Classes 900# and above to minimize bonnet leakage. However, valves with Pr-seal Bonnet shall have wall thickness & stem diameter as per API-600, (if required). Welded bonnets or screwed & seal welded bonnets are acceptable for sizes lower than 2" for Classes 900# & above.

12.8 In TEAL service, only licensor recommended vendors shall be considered for supply of valves.

13.0 For Non-Destructive Testing (NDT) specification , refer EIL' STD B957-6-44-0016.

14.0 For Welding specifications, refer EIL specs. 'Welding Specification for fabrication of piping(6-77-0001 & B957-999-06-41-WSP-0001)' & 'Welding charts for piping classes (B957-999-06-41-WSC-0001)'.

15.0 For 'Caustic Soda service graph' refer sheet 20 of 20.

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TABLE FOR MIDDLE NUMBER

Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
1	CA=1.5 General Process, Condensate	CA=1.5	CA=NIL (SS304)	CA=NIL (SS316)
2	CA=1.5 Steam & Boiler Feed Water (IBR)	CA=1.5 Steam (IBR)	CA=NIL (SS304-CRYO)	CA=NIL (SS321-CRYO)
3	CA=1.5 (CAT'D) PLANTAIR, NITROGEN, SERVICE WATER, INSTRUMENT AIR-OFFSITES	CA=6.0	CA=NIL (CAT 'D' SS304) INSTRUMENT AIR-UNITS	CA=1.5 (SS321) HYDROCARBON
4	CA=1.5 (LTCS)	CA=3.0 GENERAL PROCESS	CA=1.5 (SS304H)	CA=NIL (SS321)
5	CA=1.5 (Hydrogen)	CA=1.5 (Hydrogen)>230^{O}C	CA=3.0 (SS304H)	CA=NIL (SS316H) – H_2
6	CA=4.5 General Process	CA=4.5	CA=1.5 (SS304L)	CA=NIL (SS316H)
7	CA=1.5 (Vacuum)		CA=NIL (SS304L-Vacuum)	CA=NIL (SS347)
8	CA=1.5 (Conc.Sulphuric Acid)		CA=1.5 (SS304L-CRYO)	CA=1.5 (SS347)
9	CA=3.0		CA=1.5 (SS304)	CA=1.5 (SS316)
10	CA=1.5 (Offsites)			
11	CA=3.0 (Hardness controlled)		CA=NIL (SS304L)	
12			CA=NIL (SS304-IBR)	
13	CA=6.0			
15	CA=3.0 (Core Jacketed Piping)		CA=1.5 (SS304 H_2 & CO_2)	CA=1.5 (SS321H - H_2)
16	CA=4.5 (NACE)	CA=4.5 (NACE)	CA=1.5 (SS304L - NACE)	CA=1.5 (SS321 - NACE)
17	CA=3.0 (dry Chlorine)			
18	CA=1.5 (Oxygen)		CA=NIL (SS304L-Oxygen)	
19	CA=3.0 (Caustic / Amine, Stress relieved)			
20	CA=1.5 (Jacket for A15A)	CA=3.0 (IBR)	CA=NIL SS304/304L DUAL; T2, SLURRY, PRECURSOR	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
			(PPU: LGP09, LGP27, L7E28)	
21	CA=1.5 T2; SLURRY CATALYST AND PRECURSOR (PPU: LGP01, LGP16)		CA=NIL SS304/304L DUAL; HYDROCARBON & HP NITROGEN, CHEMICAL, VENTS (PPU:L7G7 & L7C8F)	
22	CA=1.5 IBR ASME SEC- I (LUMMUS PMS CLASS-F1AS)	CA=1.5 IBR ASME SEC- I (LUMMUS PMS CLASS-F54AS/G54AS/G58AS)		
23		CA=4.5 GENERAL PROCESS (LUMMUS PMS CLASS-D56F)	CA=NIL SS304/304L RESIN GRAVITY FLOW; ROTARY FEEDER VENTS PPU & UNIVATION: L7A1	CA=0 SS321 HYRDOCARBON (LUMMUS PMS CLASS-D26A)
24	CA=1.5 HYDROCARBON PROCESS, NITROGEN – CYCLIC PPU: LGP08, LGP21		CA=NIL SS304/304L DUAL CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE PPU: LGP41	
25	CA=1.5 CARBON MONOXIDE, REACTION KILL PPU: LGP36			
26				
27	CA=1.5 PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) PPU: LGZ18		CA = 0 DENSE PHASE CONVEYING; DILUTE PHASE CONVEYING; ADDITIVE CONVEYING LLDPE SWING: 7C50	
28	CA=1.5 CYCLE GAS, CYCLIC SERVICE NITROGEN		CA=NIL SS304/304L DUAL RESIN	CA=NIL SS316/316L DUAL RESIN CONVEYING

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	PPU:LGP24, LPZ04		CONVEYING / DILUTE PHASE / PELLETS PPU: LC52	GRAVITY FLOW PPU: LGP40
29			CA=NIL SS304/304L DUAL TUBING CHEMICALS; PPU: LC51	
32	CA=1.5 (Tracing)		CA=NIL (Tracing)	
33	CA=1.5 (Fire Water)			
34			CA = 0MM SS304/304L DUAL PROCESS TUBING – RO, CATALYST BLOW BACK PPU:LGP55	CA = 0MM CHEMICALS (TUBING) LLDPE SWING: 6G71
35				CA = 0MM ADDITIVES (ADDITIVES) LLDPE SWING: 6G73
36	CA = 1.5 KILL GAS, HYDROGEN LLDPE SWING: 1G4/1G4A, 1K6		CA = 0 HYDROGEN, KILL GAS LLDPE SWING: 6G57, 7K6	
37			SS304 Tubing : General Purpose LLDPE SWING: 6G69	
40	CA=3 MM LTCS (LUMMUS PMS CLASS-A2A,B2A,D2A,E2A)			
41	CA=1.5 CS HC, OFFGAS, N-HEXANE/C6, BUTENE VAPOR,N2, LIQ. BUTENE CATALYST (AXENS PMS CLASS: A1A, B1A)		CA=0 SS316 VALVES CRYO (LUMMUS PMS CLASS-A21K/A21L/B21K/B21L/D21K/D21L/E21K)	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
42	CA=1.5 LTCS CLEAN HYDROCARBONS (mixture ethylene/butene) At low temperature (or risk of low temp) - 45°C MINI LIQUID BUTENE (AXENS PMS CLASS A1K, B1K, C1K)		CA=NIL SS304/304L DUAL; CRYO HYDROCARBON. HP NITROGEN, HC-FLARE (PPU:L6E57, L6G5, LC62, LGP45)	
43	CA=1.5 LTCS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY), LIQUID BUTENE (AXENS PMS CLASS A2K, B2K)		CA = 0 HYDROCARBONS LLDPE SWING: 6E57	
44	CA=1.5 CS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) (AXENS PMS CLASS A2A, B2A)		CA=0.75 SS DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) (AXENS PMS CLASS A2S, B2S)	
45	CA=1.5 CS SPENT CATALYST HC SLURRY) (AXENS PMS CLASS A3A, B3A)		CA=0.75 SS SPENT CATALYST HC SLURRY) (AXENS PMS CLASS A2S, B2S)	
46	CA=1.5 LTCS HC SLURRY (POLYMER+CATALYS T) EFFLUENT, EVAPORATION LINES (BUTENE UNIT) (AXENS PMS CLASS A3K, B3K)		CA=NIL SS304/304L DUAL; CRYO + CYCLIC SERVICE PRODUCT DISCHARGE (PPU: LGP44)	
47	CA=1.5 LTCS HYDROCARBONS, HP NITROGEN LLDPE SWING: 2E63			
48	CA=1.5 LTCS			

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	CONVEYING SOLIDS LLDPE SWING: 2E65			
49	CA			
50				
51				
52	CA=3.0mm H2 (LUMMUS PMS CLASS-A1E/B1E/D1E)	CA=3.0mm H2 (LUMMUS PMS CLASS-D54E)		
53		CA=6.0 H2		
54			CA=NIL (DUAL SS304/304L-H2) PPU:LPZ17	
55	CA=1.5 MM H2 PPU: LGP57, LGP31		CA=NIL SS304/304L DUAL; HYDROGEN, KILL GAS (PPU:L7K6D)	
56				
57				
58				
59				
60	CA=1.5 NACE-PWHT		CA=NIL SS304L-NACE (LUMMUS PMS CLASS-A22A/B22A)	
61	CA=3.0 NACE-PWHT (LUMMUS PMS CLASS-A1WR/B1WR)			
62	CA=6.0 NACE-PWHT (LUMMUS PMS CLASS-A1WS/B1WS)			
68				
69	CA=6.0 CAUSTIC SERVICE, MONEL TRIM VALVES (LUMMUS PMS CLASS-A1NR)			CA=0 SPENT CAUSTIC (WAO UNIT)
71	CA=3.0mm		CA=0	

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	(LUMMUS PMS CLASS-A1DV/B1DV)		(SS304-VACUUM) (LUMMUS PMS CLASS-A21PB)	
81	CA=1.5 Alkyls, Additives, Chemicals, Chlorinated Chemicals LLDPE SWING:1C17, 1E20, 1K8		CA=0 ALKYLS LLDPE SWING:7C28, 7E28	
82	Ca=1.5 MM CONVEYING SOLIDS LLDPE SWING:1C14, 1E23			
83	CA=3.0mm H2SO4 ALLOY20 VALVES (LUMMUS PMS CLASS-A1F)			
84	CA=1.5 LLDPE CYCLE GAS LLDPE SWING: 1E22			
85				
86	CA=1.5 MM Reactor Product Discharge - Product Conveying LLDPE SWING: 1E64			
87	CA=3 MM Benzene (LUMMUS PMS CLASS-A1D)			
88	CA = 1.5 CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN LLDPE SWING: 1C11 & 1E18			
89	CA=1.5 MM Cycle Pipe LLDPE SWING: 1E87			
91	CA=1.5 U/G Cooling Water,			

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Middle Number	Carbon Steel A	AlloySteel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
	3LPE COATED			
92			CA=0mm SS316 SS VALVES (LUMMUS PMS CLASS-A21A/B21A/F21B)	
93	CA=1.5 Construction Water, Grey water A/G			
94	CA=1.5 A/G Fire Water-Fresh Water			CA=0 Concentrate Foam
95	CA=1.5 CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING			
96	CA= 1.5 CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING			
97	CA=1.5 U/G Fire Water, 3LPE COATED			
98				
99	CA=3.0mm MONEL TRIM VALVES (LUMMUS PMS CLASS-A1NR/B1NR)			

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE “S” OR “X”) FOR PROJECT DEPENDENT CLASSES.

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TABLE FOR MIDDLE NUMBER

Middle Number	SS316L N	NICKEL /TITANUM J	ALLUMINIUM L	MONEL / ALLOY 20 P
1	CA=NIL	CA=NIL (NICKEL)		CA=NIL (MONEL)
2	CA=1.5 (CRYO)	CA=1.5 (NICKEL)		CA=1.5 (MONEL)
3		CA=NIL (TITANUM)		CA=NIL(ALLOY 20)
4		CA=1.5 (TITANUM)		CA=1.5 (ALLOY 20)
5	CA=1.5 H_2			
6	CA=NIL (Vacuum)			
7				
8				
9				
10				
11			CA=NIL	
12				
13				
14				
15				
16	CA=1.5(NACE)			
17				
18				CA=NIL (MONEL) OXYGEN
19				
20				
21				CA=0 ALLOY-20 SULPHURIC ACID (WAO UNIT)
32				
33				
35			CA=0 AIR: BIN PURGE, CONVEYING AIR	

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			SUPPLY LLDPE SWING: 4C3	
36			CA=0 RESIN CONVEYING LLDPE SWING: 4C4	
37			CA=0 RESIN GRAVITY FLOW 16HG VAC-30/55PSIG LLDPE SWING: 4C8	
60	CA=0 SS316L-Rich amine with ammonia (LUMMUS PMS CLASS-A24A/B24A)			
99				CA=1.5 ALLOY 400 (LUMMUS PMS CLASS-A1NR)

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE “S” OR “X”) FOR PROJECT DEPENDENT CLASSES.

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TABLE FOR MIDDLE NUMBER

Middle Number	Hastelloy / Inconel / Incoloy Q	PVC / FRP S	LINED STEEL Y	HDPE / PVDF / TEFLON Z
1	CA=NIL (INCONEL 600)	CA=NIL (PVC)	CA = NIL (TEF LINED)	CA=NIL (HDPE) H_2SO_4
2		CA=1.5 (PVC / FRP)		
3	CA = NIL (INCOLOY 800)	CA=NIL (FRP)	CA = NIL (RUBBER LINED - SOFT)	
4	CA = 1.5 (INCOLOY 800)		CA = NIL (RUBBER LINED – SEMI HARD) 30% HCL	CA = NIL (HDPE) 30% HCL
5			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) CAT 'D' SEA WATER	CA = NIL (HDPE) 50% HF
6	CA = 1.5 (INCOLOY 800H)			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	CA=0 (INCONEL 600) HIGH PRESSURE STEAM-IBR (WAO UNIT)		CA=0 CS+PTFE LINED (WAO UNIT)	
21	CA=0 (INCONEL 600) SPENT	CA=NIL (CPVC)	CA=0 PTFE Lined CS Catalyst Chemicals LLDPE SWING: 72C1	

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	CAUSTIC (WAO UNIT)			
33			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) FIRE WATER (SEA)	

NOTE: USE MIDDLE NUMBERS 21 TO 30, 91 TO 99 OR TWO ALPHABETS (EXCEPT THAT SECOND ALPHABET SHALL NOT BE "S" OR "X") FOR PROJECT DEPENDENT CLASSES.

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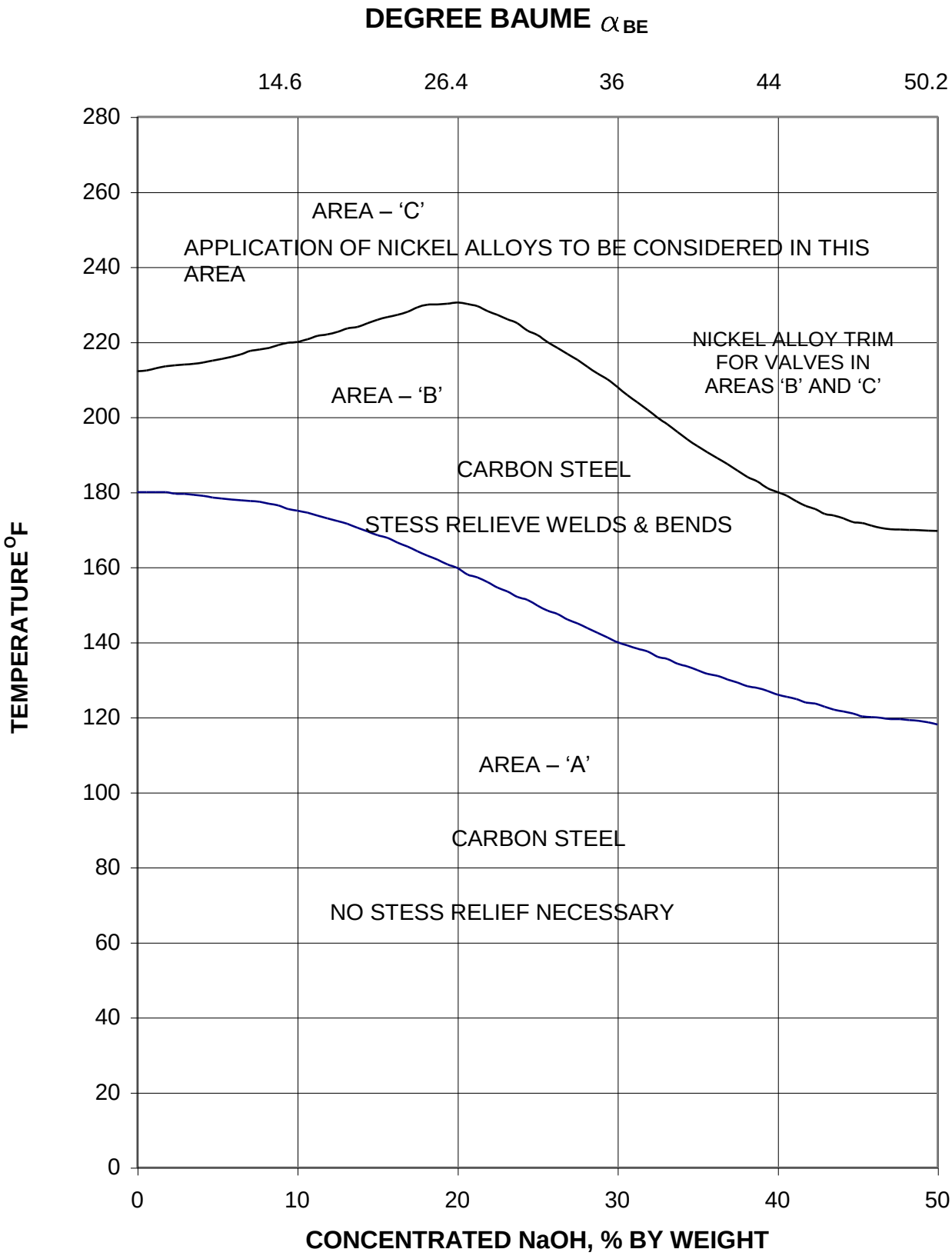
TABLE FOR PRESSURE TEMPERATURE RATING FOR BALL, PLUG & BUTTERFLY VALVES

ITEM	PRESSURE RATING (PIPING CLASS)	SIZE RANGE (NB INCHES)	PRESSURE IN kg / cm^2								
			TEMPERATURE IN ^{O}C								
			-29 TO 38	50	65	100	120	150	175	204	>204
BALL (RPTFE/PTFE Seated)	150# (AS PER PMS)	Upto 16”	19.99	19.58	19.2	17.93	17.2	16.12	15.22	7.03	DO NOT USE
	300# (AS PER PMS)		52.00	51.02	49.8	41.85	37.3	27.4	19.15	7.03	
	600# (AS PER PMS)		104.1	98.46	91.4	64.61	49.3	38.6	29.68	17.6	
PLUG (RPTFE/PTFE Seated)	150# (AS PER PMS)	Upto 8”	19.33	19.3	18.63	17.6	16.89	15.82	14.93	14.06	
	300# (AS PER PMS)		52.02	50.35	48.26	43.4	40.0	37.4	35.23	28.1	
PLUG (Lubricated)	150# (AS PER PMS)	Upto 12”	19.99	19.58	19.12	18.05	17.28	16.12	15.15	14.28	
	300# (AS PER PMS)		52.0	51.1	49.96	47.3	46.82	46.1	45.5	44.6	
	600# (AS PER PMS)		104.1	102.2	99.95	94.7	93.74	92.3	91.1	89.4	
Butterfly (Soft Seat)	150# (A3A, A5Y)	Upto 48”	10.55	10.55	10.55	DON’T USE					DO NOT USE
	150# (A33A, A33Y)		16	16	16						
	150# (RPTFE/PTFE Seat)		19.99	19.58	19.2	17.93	17.20	16.12	15.22	7.03	

NOTE: IF THE CLASS PRESSURE / TEMPERATURE IS LOWER THAN THIS TABLE, CLASS PRESSURE / TEMPERATURE TO BE FOLLOWED.

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CAUSTIC SODA SERVICE GRAPH



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ANNEXURE - II (TO PMS)

PIPING MATERIAL SPECIFICATION EXTRACTS

Client : BPCL

Project : MPMC & EPCM-1 FOR BPREP

Location : BINA, MADHYA PRADESH

Job No. : B957

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	28/02/2025	ISSUED FOR ENGINEERING	SV/SRG	PK	SNH

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Abbreviations:

PMS : Piping Material Specifications.

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Sl. No.	Description	Pages
1.	Piping Material Specification Extracts, (B957-6-44-0005-A2) Rev.0 Annexure - II	38

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

INDEX OF SPECIFICATIONS

A11A	REV 0	, A19A	REV 0	, A1A	REV 0	, A1D	REV 0 ,
A1K	REV 0	, A1N	REV 0	, A20K	REV 0	, A21A	REV 0 ,
A21K	REV 0	, A21P	REV 0	, A21Y	REV 0	, A23K	REV 0 ,
A24A	REV 0	, A24K	REV 0	, A27K	REV 0	, A28K	REV 0 ,
A28M	REV 0	, A2A	REV 0	, A32A	REV 0	, A34M	REV 0 ,
A35L	REV 0	, A35M	REV 0	, A36L	REV 0	, A37K	REV 0 ,
A37L	REV 0	, A3A	REV 0	, A3K	REV 0	, A40A	REV 0 ,
A41A	REV 0	, A41K	REV 0	, A42A	REV 0	, A42K	REV 0 ,
A43A	REV 0	, A44A	REV 0	, A44K	REV 0	, A45A	REV 0 ,
A45K	REV 0	, A46A	REV 0	, A4A	REV 0	, A60K	REV 0 ,
A61A	REV 0	, A62A	REV 0	, A69M	REV 0	, A6K	REV 0 ,
A71A	REV 0	, A81A	REV 0	, A81K	REV 0	, A82A	REV 0 ,
A83A	REV 0	, A88A	REV 0	, A8A	REV 0	, A91A	REV 0 ,
A92K	REV 0	, A94A	REV 0	, A94M	REV 0	, A95A	REV 0 ,
A96A	REV 0	, A97A	REV 0	, A99A	REV 0	, A9A	REV 0 ,
B1A	REV 0	, B1K	REV 0	, B20D	REV 0	, B20K	REV 0 ,
B20Y	REV 0	, B21A	REV 0	, B21P	REV 0	, B21Q	REV 0 ,
B24A	REV 0	, B27A	REV 0	, B28A	REV 0	, B2A	REV 0 ,
B40A	REV 0	, B41A	REV 0	, B41K	REV 0	, B42A	REV 0 ,
B42K	REV 0	, B43A	REV 0	, B43K	REV 0	, B44A	REV 0 ,
B44K	REV 0	, B45A	REV 0	, B45K	REV 0	, B46A	REV 0 ,
B46K	REV 0	, B47A	REV 0	, B48A	REV 0	, B4A	REV 0 ,
B4D	REV 0	, B52A	REV 0	, B55A	REV 0	, B5A	REV 0 ,
B60K	REV 0	, B61A	REV 0	, B62A	REV 0	, B69M	REV 0 ,
B81A	REV 0	, B82A	REV 0	, B84A	REV 0	, B86A	REV 0 ,
B88A	REV 0	, B89A	REV 0	, B92K	REV 0	, B99A	REV 0 ,
B9A	REV 0	, D1A	REV 0	, D1K	REV 0	, D20K	REV 0 ,
D20Q	REV 0	, D21K	REV 0	, D23F	REV 0	, D23M	REV 0 ,
D28A	REV 0	, D2A	REV 0	, D2D	REV 0	, D34K	REV 0 ,
D36A	REV 0	, D36K	REV 0	, D40A	REV 0	, D41K	REV 0 ,
D42A	REV 0	, D42K	REV 0	, D4A	REV 0	, D54K	REV 0 ,
D55A	REV 0	, D5A	REV 0	, D69M	REV 0	, D81K	REV 0 ,
D9A	REV 0	, F22A	REV 0	, F25A	REV 0	, F29K	REV 0 ,
F2A	REV 0	, F2G	REV 0	, F36A	REV 0	, F36K	REV 0 ,
F55K	REV 0	, F81A	REV 0	, F92K	REV 0	, F9A	REV 0 ,
G22G	REV 0	, G2G	REV 0	, J2A	REV 0	, J95A	REV 0

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A11A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : A672GR.B60 CL.12 (200 BHN M/ FROM 16.000 TO ******
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
MILD SOUR FLARE (NON NACE) - REFER NOTE 34.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A19A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 36.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NONNACE MILD CORROSIVE SOUR & AMINE - STRESS RELIEVED; NON NACE SOUR FLARE.

CAUSTIC (STRESS RELIEVED ZONE)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
PLUG	00.500	24.000
BTRFLY	03.000	36.000

PIPING MATERIAL CLASS : A1A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NON CORROSIVE/ FLAMMABLE / NON FLAMMABLE/ NON LETHAL -PROCESS & HYDROCARBONS; FUEL GAS,HYDROCARBON FLARE ; LUBE OIL BEFORE FILTER; AMMONIA, STEAM & CONDENSATE (NON IBR); UTILITIES- INST AIR(BEYOND A3A IN OFFSITES DISTRIBUTION), OWS (PRESSURIZED), PLANT AIR, NITROGEN, CARBONDIOXIDE, ; WATER - BEYOND A3A, DECOKING AIR, MINERAL OIL, PROCESS AIR, REGENERATION NITROGEN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	36.000
BTRFLY	03.000	48.000

PIPING MATERIAL CLASS : A1D REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.38	20.38	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
NON CORROSIVE HYDROCARBON & PROCESS SERVICES. FLAMMABLE & NON-LETHAL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

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PIPING MATERIAL CLASS : A1K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
PURE NON CORROSIVE OR MILD CORROSIVE HYDROCARBONS FLAMMABLE/NON FLAMMABLE & NON LETHAL HYDROCARBONS, LUBE OIL (AFTER FILTERS), CHEMICALS ETC., NITROGEN, INSTRUMENT AIR(BEYOND CAT-'D' WITHIN UNITS & OFFSITE PACKAGES)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A1N REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP316L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP316L FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.24	10.54	9.84	8.78	7.73

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE/NON FLAMMABLE & NON LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A20K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 03.000

Temp (deg. C)	- 48.0	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	19.30	19.30	19.30	16.20	14.40

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP09)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.750	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A21A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	20.00	20.00	18.30	16.20	10.50

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP01)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A21K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000

Temp (deg. C)	- 29.0	- 29.0	38.0	93.0	149.0	204.0	260.0	260.0	270.0
Press (Kg/sq. cm g)	19.30	- 0.60	19.30	16.20	14.40	13.40	- 0.60	12.00	11.50

SERVICE :
CHEMICALS; VENTS (BASED ON LICENSOR PMS CLASS - L7C8F)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
CHECK	00.750	08.000
BALL	00.750	08.000

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PIPING MATERIAL CLASS : A21P REV : 0 GASKET MATERIAL : SP.WND UNS N08020+PTFE
PIPE MATERIAL : ASTM B 729 ANNLD (UNS N080 FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	20.39	20.39	18.28	16.17

SERVICE :
SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500
BALL	00.500	01.500

PIPING MATERIAL CLASS : A21Y REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	17.57	17.57	16.52	15.11

SERVICE :
CATALYST CHEMICALS (REFER LICENSOR PMS CLASS - 72C1)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A23K REV : 0 GASKET MATERIAL : WHITE SILICON RUBBER
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 36.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	65.0	110.0	110.0	190.0
Press (Kg/sq. cm g)	- 0.50	3.16	3.50	- 0.50	3.16	3.50

SERVICE :
RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - L7A1)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A24A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	- 1.00	20.00	20.00	18.30	16.20	14.10	12.00

SERVICE :
HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP08)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	01.500
BALL	00.750	20.000
BTRFLY	03.000	24.000

PIPING MATERIAL CLASS : A24K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.30	19.30	16.20	14.40	10.50

SERVICE :
CARBON BLACK; HYDROCARBON PROCESS; ORGANIC PEROXIDE (BASED ON LICENSOR PMS CLASS - LGP41)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	24.000
CHECK	00.750	24.000
BALL	00.750	24.000
PLUG	00.750	18.000
BTRFLY	03.000	24.000

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PIPING MATERIAL CLASS : A27K REV : 0 GASKET MATERIAL : WHITE NEOPRENE
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 14.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	177.0
Press (Kg/sq. cm g)	10.50	10.50

SERVICE :
DENSE/DILUTE PHASE CONVEYING; ADDITIVE CONVEYING (BASED ON LICENSOR PMS CLASS - 7C50)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	04.000
MISC	02.000	14.000

PIPING MATERIAL CLASS : A28K REV : 0 GASKET MATERIAL : EPDM WHITE (SHORE A-60)
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 01.000 TO 12.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	110.0	115.0	
Press (Kg/sq. cm g)	19.30	19.30	15.60	15.50	

SERVICE :
RESIN CONVEYING / DILUTE PHASE / PELLETS (BASED ON LICENSOR PMS CLASS - LC52)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.750	03.000
MISC	02.000	12.000

PIPING MATERIAL CLASS : A28M REV : 0 GASKET MATERIAL : EPDM WHITE (SHORE A-60)
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A358 TP316/316L CL.1 DU FROM 10.000 TO 24.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	- 29.0	38.0	82.0	121.0	121.0
Press (Kg/sq. cm g)	10.50	- 0.60	10.50	10.50	- 0.60	3.90

SERVICE :
RESIN CONVEYING GRAVITY FLOW (BASED ON LICENSOR PMS CLASS - LGP40)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
BALL	00.500	04.000
BTRFLY	02.000	24.000
MISC	02.000	24.000

PIPING MATERIAL CLASS : A2A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	280.0	300.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	11.19	10.44	7.73

SERVICE :
STEAM (IBR), BOILER FEED WATER (IBR) & CONDENSATE (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	36.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	01.500
PISTON	00.500	01.000

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PIPING MATERIAL CLASS : A32A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	280.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	11.19

SERVICE :
NONIBR STEAM TRACING (BEYOND STEAM SUPPLY MANIFOLD ISOLATION VALVES),NONIBR TRACER CONDENSATE. IN CASE PRES-INSULATED TUBING IS TO BE USED, THIS SPEC SHALL BE USED ONLY FOR TRACING ALONG CS TRACED PIPING.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	01.500
CHECK	00.250	24.000
BALL	00.500	03.000
PISTON	00.500	01.000

PIPING MATERIAL CLASS : A34M REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	121.0
Press (Kg/sq. cm g)	175.70	175.70	126.50

SERVICE :
CHEMICALS (BASED ON LICENSOR PMS CLASS - 6G71)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.000
GLOBE	00.250	01.000
CHECK	00.250	01.000
BALL	00.250	01.000

PIPING MATERIAL CLASS : A35L REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
AIR: BIN PURGE, CONVEYING AIR SUPPLY (BASED ON LICENSOR PMS CLASS - 4C3)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A35M REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 46.0	- 29.0	107.0
Press (Kg/sq. cm g)	175.70	196.80	196.80

SERVICE :
ADDITIVES (BASED ON LICENSOR PMS CLASS - 6G73)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.250	00.750
CHECK	00.250	00.750
BALL	00.250	00.750
NEEDLE	00.250	00.750

PIPING MATERIAL CLASS : A36L REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
RESIN CONVEYING (BASED ON LICENSOR PMS CLASS - 4C4)

VALVE DETAILS

TYPE	FROM	TO

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PIPING MATERIAL CLASS : A37K REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	- 46.0	260.0	400.0
Press (Kg/sq. cm g)	175.76	175.76	10.54

SERVICE :
ALL PURPOSE (BASED ON LICENSOR PMS CLASS - 6G69)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.125	01.000
CHECK	00.125	01.000
BALL	00.125	01.000
NEEDLE	00.125	00.750

PIPING MATERIAL CLASS : A37L REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	
Press (Kg/sq. cm g)	

SERVICE :
RESIN GRAVITY FLOW; ROTARY FEEDER VENTS (BASED ON LICENSOR PMS CLASS - 4C8)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : A3A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 FROM 16.000 TO 96.000

Temp (deg. C)	0.0	38.0	50.0	65.0	100.0	150.0	186.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55	10.55	10.55	10.55

SERVICE :
NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DIOXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR), CRWS/ SS/ VENT (A/G). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	48.000
BALL	00.500	16.000
BTRFLY	03.000	48.000

PIPING MATERIAL CLASS : A3K REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	0.0	38.0	93.0	149.0	186.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55	10.55

SERVICE :
DEMINERALISED WATER (OUTSIDE DM PLANT BATTERY LIMITS), POLISHED WATER, POLISHED CONDENSATE, DM WATER BEYOND CATEGORY - 'D', NITROGEN, INSTRUMENT AIR(WITHIN UNITS & OFFSITE PACKAGES) - CATEGORY 'D'

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

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PIPING MATERIAL CLASS : A40A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06	11.94

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETC., DRY FLARE, LIQUID DRAIN, PROPYLENE REFRIGERANT, ETHYLENE REFRIGERANT

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A41A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
CLEAN HYDROCARBONS VAPOR/LIQUID, OFF GAS, N-HEXANE/C6, BUTENE VAPOR, NITROGEN, LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	14.000
GLOBE	00.250	14.000
CHECK	00.250	14.000
BALL	00.500	18.000

PIPING MATERIAL CLASS : A41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 30.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 196.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS & HYDROCARBON SERVICES BELOW MINUS 45 DEG C - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL- LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
CLEAN HYDROCARBONS (MIXTURE ETHYLENE / BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) - 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

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Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 30.000

Temp (deg. C)	- 110.0	38.0	93.0	149.0	204.0	260.0	260.0
Press (Kg/sq. cm g)	19.30	19.30	16.20	14.40	13.40	12.00	- 0.60

SERVICE :
HYDROCARBONS - FLARE (BASED ON LICENSOR PMS CLASS - LC62)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	14.000
GLOBE	00.750	04.000
CHECK	00.750	04.000

PIPING MATERIAL CLASS : A43A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A44A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A44K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST
(RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A45A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A45K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35	11.95	9.84	8.78	7.73

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	16.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A46A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM, PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : A4A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	- 45.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	18.63	18.63	17.92	16.17	14.06

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - BELOW -29 DEG C AND UPTO -45 DEG C. HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, VENTS(HIGH TEMPERATURE) ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
BTRFLY	03.000	36.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A60K REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 358 TP304L CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.30

SERVICE :
RICH AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A61A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 30.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
AMINE, SOUR HYDROCARBONS (H2S), SOUR WATER, STABILIZER COLUMN OVERHEAD (H2S ENVIRONMENT), ACID FLARE, METHANOL, AMINE CLOSED BLOWDOWN(MED).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	30.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A62A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 06.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	30.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A69M REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.52	15.11	13.71

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A6K REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304L CL.1 FROM 10.000 TO 24.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	16.17	16.17	13.71	12.30	11.24	10.54	9.84	8.78	7.73

SERVICE :
CORROSIVE PROCESS SERVICE - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL - FLARE GAS, ACID GAS WITH CONDENSATE, REFLUX, CORROSIVE WATER, RICH AMINE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A71A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 52.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
BT EXTRACTION W/FV

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	42.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : A81A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	165.0	177.0
Press (Kg/sq. cm g)	20.03	20.03	18.27	16.17	14.06	7.03

SERVICE :
ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1C17)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	03.000

PIPING MATERIAL CLASS : A81K REV : 0 GASKET MATERIAL : SS 316+GRAFIL+SS 316 I-RING

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 03.000

Temp (deg. C)	- 40.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.30	19.30	16.17	14.41	13.35

SERVICE :
ALKYL (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 3/4 INCH SIZES MAXIMUM.) (BASED ON LICENSOR PMS CLASS - 7C28)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	03.000
BALL	00.500	06.000

PIPING MATERIAL CLASS : A82A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING

CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 03.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	165.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06

SERVICE :
SOLIDS CONVEYING (BASED ON LICENSOR PMS CLASS - 1C14)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	03.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A83A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	65.0	93.0
Press (Kg/sq. cm g)	20.03	20.03	19.17	18.28

SERVICE :
SULFURIC ACID (93 ~ 98% CONCENTRATION, MAX. VELOCITY 0.9 M/S)

VALVE DETAILS

TYPE	FROM	TO
GATE	02.000	24.000
GLOBE	02.000	16.000
CHECK	02.000	24.000

PIPING MATERIAL CLASS : A88A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 150

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95

SERVICE :
CYCLIC PRESSURE;HYDROCARBONS (BASED ON LICENSOR PMS CLASS - 1C11)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.750	24.000
CHECK	00.750	18.000

PIPING MATERIAL CLASS : A8A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 06.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	20.03	20.03	19.17

SERVICE :
SULPHURIC ACID (80-98% CONC.) - TOXIC BUT NON LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000
BALL	00.500	06.000
PLUG	00.500	06.000

PIPING MATERIAL CLASS : A91A REV : 0 GASKET MATERIAL : NONASBESTOS BS7531 GR X
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO ******
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55

SERVICE :
COOLING WATER, RAW WATER, SERVICE WATER (UNDER GROUND) CATEGORY "D"

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	48.000
BALL	00.500	16.000
BTRFLY	03.000	48.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A92K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	19.33	19.33	16.17	14.41	13.35

SERVICE :
LUBE OIL, SEAL OIL, TRUE INHIBITOR DNBP, TBC, AKOH SOLUTION, PHOSPHATE, DMDS INJECTION, DEMINERALIZED WATER(BEYOND CATEGORY 'D').

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : A94A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 FROM 16.000 TO 48.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90	18.90

SERVICE :
FIRE WATER-FRESH WATER (ABOVE GROUND)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A94M REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 312 TP316 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	65.0
Press (Kg/sq. cm g)	9.00	9.00	9.00

SERVICE :
CONCENTRATE FOAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000
BALL	00.500	08.000

PIPING MATERIAL CLASS : A95A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO 36.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	1.03	1.03	1.03	1.03

SERVICE :
CRWS, OWS/ SS/ VENT (CATEGORY-'D') U/G WITH 3L PE COATING

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	48.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BTRFLY	03.000	48.000

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Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : A96A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55	10.55

SERVICE :
CRWS, OWS (CATEGORY-'D') U/G, STORM SEWER (CATEGORY-'D') U/G WITH 3L PE COATING

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A97A REV : 0

GASKET MATERIAL : NONASBESTOS BS7531 GR X
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.500
PIPE MATERIAL : ASTM A 106 GR.B (PE COATEI FROM 02.000 TO 14.000
PIPE MATERIAL : IS-3589 GR.410 (PE COATED) FROM 16.000 TO 36.000

Temp (deg. C)	0.0	38.0	50.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90	18.90

SERVICE :
FIRE WATER- FRESH WATER (UNDER GROUND)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.250	16.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : A99A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 48.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	60.0	93.0	149.0
Press (Kg/sq. cm g)	20.03	20.03	19.33	18.28	16.17

SERVICE :
CAUSTIC SERVICE, SODIUM HYDROXIDE, HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 30 WT% AT MAX. TEMPERATURE 60 DEG. C, 40 WT% AT MAX. TEMPERATURE 50 DEG.C, AND 50 WT% AT MAX. TEMPERATURE 45 DEG.C), CAUSTIC BLOWDOWN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : A9A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 150
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO ******

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS SERVICES - FLAMMABLE / NON FLAMMABLE & NON LETHAL - HVGO,VGO,RCO,SLOP,VR,VGO,CAUSTIC (NO STRESS RELIEF ZONE), BENZENE, CGC AREA CBD, DEBUTANIZER AREA CBD, PGH AREA CBD, QUENCH WATER DRAIN, QUENCH OIL BLOW DOWN, AROMATIC CLOSED DRAIN, CLOSED SOLVENT DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	42.000
GLOBE	00.250	16.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B1A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - HYDROCARBONS, AROMATICS, AMMONIA, SWEET GAS, FLUSHING OIL AND OTHER UTILITIES -MP CONDENSATE, INSTRUMENT AIR(OFFSITES), PLANT AIR, NITROGEN, AMMONIA GAS, NITROGEN-HIGH TEMPERATURE ETC. ABOVE CLASS 'A1A'.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B1K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/ NON FLAMMABLE & NON LETHAL HYDROCARBONS, CHEMICAL, LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B20D REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 20.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49	15.11	14.72

SERVICE :
HP STEAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : B20K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	50.60	50.60	40.10	26.70

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP27)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B20Y REV : 0 GASKET MATERIAL : GARLOCK STYLE 3540/GORETEX GR
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B(PTFE LINED) FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05

SERVICE :
SPENT CAUSTIC, SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B21A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.00	52.00	40.10	26.70	13.40

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - LGP16)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B21P REV : 0 GASKET MATERIAL : SP.WND UNS N08020+PTFE+I RING
PIPE MATERIAL : ASTM B 729 ANNLD (UNS N080 FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.73	52.73	52.02	49.91	47.81

SERVICE :
SULFURIC ACID

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500
BALL	00.500	01.500

PIPING MATERIAL CLASS : B21Q REV : 0 GASKET MATERIAL : UNS N06600+VRMICULITE+N06600IR
PIPE MATERIAL : ASTM B 167 (UNS N06600) FROM 00.500 TO 03.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	51.32	49.56	46.75

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500

PIPING MATERIAL CLASS : B24A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.00	52.00	47.50	46.00	44.60	42.20

SERVICE :
HYDROCARBON PROCESS, NITROGEN - CYCLIC (BASED ON LICENSOR PMS CLASS - LGP21)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	16.000
GLOBE	00.750	10.000
BALL	00.750	08.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B27A REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.00	52.00	47.50	46.00	44.60

SERVICE :
PRODUCT CONVEYING (CYCLIC SERVICE); PRODUCT DISCHARGE (CYCLIC SERVICE) (BASED ON LICENSOR PMS CLASS - LPZ18)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	16.000
GLOBE	00.750	12.000
CHECK	00.750	16.000
BALL	00.750	16.000
BTRFLY	06.000	16.000

PIPING MATERIAL CLASS : B28A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.C70 CL.32 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	46.70	46.70	46.70	46.00	44.60

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - LGP24)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	48.000
GLOBE	00.500	12.000
CHECK	00.500	48.000
BALL	00.500	24.000

PIPING MATERIAL CLASS : B2A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 30.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
SBOILER BLOWDOWN, LP BOILER FEED WATER, MP STEAM, MP CONDENSATE-ALL IBR

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PISTON	00.500	01.000

PIPING MATERIAL CLASS : B40A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 72.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23	41.13

SERVICE :
NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -47 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETHYLENE ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B41A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 18.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
CLEAN HYDROCARBONS VAPOR/LIQUID OFF GAS
N-HEXANE/C6, BUTENE VAPOR, NITROGEN , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	18.000
GLOBE	00.250	12.000
CHECK	00.250	18.000
BALL	00.500	18.000

PIPING MATERIAL CLASS : B41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 42.000

Temp (deg. C)	- 196.0	38.0	93.0	120.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	40.14

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL-LOW TEMPERATURE HYDROCARBON, COLD FLARE, LIQUID DRAIN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
CLEAN HYDROCARBONS (MIXTURE EHYLENE/BUTENE)
AT LOW TEMPERATURE (OR RISK OF LOW TEMP)
- 45°C MINIMUM , LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 12.000
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000

Temp (deg. C)	- 110.0	- 101.0	38.0	93.0	149.0	180.0	204.0	260.0	316.0	343.0
Press (Kg/sq. cm g)	49.90	50.60	50.60	42.20	38.00	36.20	34.80	32.60	30.90	30.20

SERVICE :
HYDROCARBONS-LIQUID / VAPOR; LOW TEMPERATURE AND HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASSES - LGP45 & L6E57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000
CHECK	00.750	12.000
BALL	00.750	06.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B43A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) - 45°C MINIMUM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B43K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 12.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 110.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0
Press (Kg/sq. cm g)	49.91	49.91	43.59	37.37	36.20	33.74	31.63	31.28

SERVICE :
HYDROCARBONS:LOW TEMPERATURE & HIGH TEMPERATURE (BASED ON LICENSOR PMS CLASS - 6E57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	12.000
GLOBE	00.750	12.000
CHECK	00.500	12.000
BALL	01.000	12.000

PIPING MATERIAL CLASS : B44A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B44K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
DILUTED T.E.A. CATALYST, LC 2253 CATALYST (RISK OF SLURRY)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B45A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 20.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
HC SLURRY (POLYMER + CATALYST):- PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B45K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80	32.69	30.93	30.23	29.52	29.17	28.47	27.77

SERVICE :
SPENT CATALYST, HC SLURRY

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000
BALL	00.500	20.000

PIPING MATERIAL CLASS : B46A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
HC SLURRY (POLYMER + CATALYST) AT LOW TEMPERATURE (OR RISK OF LOW TEMPERATURE) -45°C MINIMUM PUMPAROUND, EFFLUENT, EVAPORATION LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	14.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : B46K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
PIPE MATERIAL : ASTM A358 TP304/304L CL.1 FROM 10.000 TO 12.000

Temp (deg. C)	- 46.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	50.60	50.60	40.10	26.70	10.50

SERVICE :
PRODUCT DISCHARGE (BASED ON LICENSOR PMS CLASS - LGP44)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000
BALL	00.750	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B47A REV : 0

GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 20.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 01.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 01.500 TO 14.000

Temp (deg. C)	- 46.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	50.62	50.62	43.59	39.37	36.20	33.74

SERVICE :
HYDROCARBONS, HP NITROGEN, RECOVERED GAS (BASED ON LICENSOR PMS CLASS - 2E63 & 2E18).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	20.000
GLOBE	00.500	12.000
CHECK	00.500	20.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B48A REV : 0

GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 01.500 TO 03.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 01.000

Temp (deg. C)	- 40.0	38.0	93.0	149.0	177.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	17.57	10.54

SERVICE :
CONVEYING SOLIDS (BASED ON LICENSOR PMS CLASS - 2E65)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	03.000

PIPING MATERIAL CLASS : B4A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 24.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	48.86	48.86	46.40	45.72	44.99	43.23

SERVICE :
NON CORROSIVE PROCESS, FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS, XYLENE,PROPYLENE,LPG, METHANOL, NH3, GAS FLARE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B4D REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO ******

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	52.73	52.73	52.73	50.62	48.86	46.75	42.53	41.48	40.07	37.26	35.85	34.09	31.63	22.49	15.11

SERVICE :
NON CORROSIVE HYDROCARBONS ABOVE 454 DEG C
- FLAMMABLE & NON LETHAL- HIGH TEMPERATURE TRANSFER LINES.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B52A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	43.66

SERVICE :
HYDROGEN (FEED & PRODUCT)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	16.000
CHECK	00.500	24.000
BALL	00.500	16.000
BTRFLY	03.000	24.000

PIPING MATERIAL CLASS : B55A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0
Press (Kg/sq. cm g)	52.00	52.00	47.80

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP57)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.500	02.000
CHECK	00.500	02.000

PIPING MATERIAL CLASS : B5A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	43.66

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE, TOXIC/NON-TOXIC BUT NON-LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B60K REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 312 TP304L FROM 00.500 TO 04.000

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	42.18	42.18	35.85	31.99	29.52

SERVICE :
RICH AMINE, RICH AMINE WITH FLASHING H2S.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B61A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53

SERVICE :
NACE CORROSIVE, FLAMMABLE AND NONLETHAL SOUR SERVICES (STRESS RELIEVED)
- SOUR WATER, AMINE, SOUR HYDRO CARBONS(H2S), METHANOL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B62A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 06.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53

SERVICE :
AMINE, RICH AMINE WITH FLASHING H2S

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : B69M REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU/ FROM 00.500 TO 08.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	50.50	50.50	43.59	39.37	36.20	33.74

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

PIPING MATERIAL CLASS : B81A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	66.0	93.0	110.0	149.0
Press (Kg/sq. cm g)	52.02	52.02	49.70	47.45	47.03	46.05

SERVICE :
ALKYLS,ADDITIVES & CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1E20)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : B82A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 04.000
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300

Temp (deg. C)	- 29.0	38.0	66.0	93.0	149.0	177.0
Press (Kg/sq. cm g)	45.69	45.69	42.18	33.74	16.87	7.03

SERVICE :
COVEYING SOILDS (BASED ON LICENSOR PMS CLASS - 1E23)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B84A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	29.87	29.87	29.87	29.87	29.87

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E22)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	24.000
GLOBE	00.500	12.000
CHECK	00.750	24.000
BALL	00.750	10.000

PIPING MATERIAL CLASS : B86A REV : 0

GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 16.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64

SERVICE :
REACTOR PRODUCT DISCHARGE-PRODUCT CONVEYING (BASED ON LICENSOR PMS CLASS - 1E64)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	00.750
BALL	00.500	08.000

PIPING MATERIAL CLASS : B88A REV : 0

GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 12.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	52.02	52.02	47.45	46.05	44.64	42.18

SERVICE :
CYCLIC PRESSURE, HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - 1E18)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.500	12.000
CHECK	00.750	12.000
BALL	00.750	01.000

PIPING MATERIAL CLASS : B89A REV : 0

GASKET MATERIAL : 316S.S. 3-PLY CORRUGTED GASKET
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 24.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 30.000 TO 48.000

Temp (deg. C)	- 29.0	38.0	165.0
Press (Kg/sq. cm g)	47.45	47.45	45.34

SERVICE :
CYCLE GAS (BASED ON LICENSOR PMS CLASS - 1E87)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.750	24.000
BALL	00.750	10.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : B92K REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	50.50	50.50	42.18	37.96	34.80

SERVICE :
LUBE OIL, SEAL OIL, CORROSION INHIBITOR, METHANOL INJECTION, DMDS INJECTION.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : B99A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0
Press (Kg/sq. cm g)	52.02	52.02	47.80

SERVICE :
CAUSTIC (STRESS RELIEVED ZONE), SODIUM HYDROXIDE HYDROCARBON (WITH CAUSTIC), SPENT CAUSTIC (CONCENTRATION 20%~50% AT TEMP. 93 DEG.C ~ 45 DEG.C)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : B9A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 300
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 66.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	52.02	52.02	47.80	46.05	44.64	42.53	40.07	38.66	37.26	35.50	28.82

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, ETC. HYDROCARBON,QUENCH OIL, PROCESS WATER, FUEL OIL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000
PLUG	00.500	24.000

PIPING MATERIAL CLASS : D1A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABL AND NON LETHAL - PETROLEUM PRODUCTS: FO. FG, SWEET GAS, INHIBITOR SOLUTION, NH3, BRINE (MINUS 10 DEG C), CO2, CAUSTIC SODA (20 BE MAX & TEMP 70 DEG C MAX), PARAXYLENE, BITUMEN, ETHYLENE, DONOR, VAPORIZED PROPYLENE, HIGH PRESSURE PURIFIED NITROGEN.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D1K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 24.000
ANSI RATING : 600 PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0
Press (Kg/sq. cm g)	101.24	101.24	84.36	75.57	69.95	65.38	62.21	60.80	59.40	57.99	56.94	55.54

SERVICE :
PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON
- FLAMMABLE/NON-FLAMMABLE & NON-LETHAL HYDROCARBONS, CHEMICALS ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : D20K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	101.30	101.30	85.20	75.60

SERVICE :
T2; SLURRY CATALYST AND PRECURSOR (BASED ON LICENSOR PMS CLASS - L7E28)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : D20Q REV : 0 GASKET MATERIAL : UNS N06600+VRMICULITE+N06600IR
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM B 167 (UNS N06600) FROM 00.500 TO 03.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	105.46	105.46	105.46	102.30	99.13	93.51	85.07	82.61	79.80	74.87	71.36	68.55	63.27	50.97	33.74

SERVICE :
HIGH PRESSURE STEAM

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	01.500
GLOBE	00.500	01.500
CHECK	00.500	01.500

PIPING MATERIAL CLASS : D21K REV : 0 GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 08.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	101.20	101.20	87.20	78.70	72.10	67.10	63.30	62.60	61.20	60.10	59.40

SERVICE :
HYDROCARBONS, HP NITROGEN (BASED ON LICENSOR PMS CLASS - L7G7)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
GLOBE	00.750	08.000
CHECK	00.750	08.000
BALL	00.750	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D23F REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 04.50 MM
PIPE MATERIAL : ASTM A 691 GR5CR CL.42 FROM 16.000 TO 64.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 335 GR.P5 FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	550.0
Press (Kg/sq. cm g)	105.45	105.45	103.34	98.42	93.85	90.68	85.06	82.60	79.79	74.86	71.35	68.54	52.37	38.66	28.12	24.58

	575.0	600.0	625.0	650.0
	17.95	12.34	8.16	4.79

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES - FLAMMABLE & NON-LETHAL- CRUDE OIL, RCO, LVGO, HVGO, VB, TAR, VACUUM RESIDUE, TRANSFER LINES, FUEL OIL, DIESEL, HYDROCARBONS, HIGH TEMPERATURE TRANSFER LINES

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D23M REV : 0

GASKET MATERIAL : SP.WND SS321+GRAFIL+I RING
CORROSION ALLOWANCE : 00.00 MM
PIPE MATERIAL : ASTM A 358 TP321 CL.1 FROM 10.000 TO 14.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 312 TP321 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	101.23	101.23	91.04	83.66	77.68	72.41	68.54	66.78	65.38	64.32	63.27	62.91	62.21	54.48	50.96

SERVICE :
CORROSIVE LIQUID, VAPOUR AND GAS - FLAMMABLE/NON FLAMMABLE, TOXIC/NON TOXIC BUT NON LETHAL, HYDROGENATION, PYROLYSIS GAS, SECOND STAGE REACTOR

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D28A REV : 0

GASKET MATERIAL : SS 316L
CORROSION ALLOWANCE : 01.50 MM
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 08.000
ANSI RATING : 600

Temp (deg. C)	- 29.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	104.00	94.90	92.10	88.90	84.40	77.00	75.60	74.50

SERVICE :
CYCLE GAS; CYCLIC SERVICE; NITROGEN; (BASED ON LICENSOR PMS CLASS - LPZ04)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	08.000
GLOBE	00.750	08.000
CHECK	01.500	08.000
BALL	00.750	06.000
BTRFLY	03.000	08.000

PIPING MATERIAL CLASS : D2A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000
ANSI RATING : 600
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	- 29.0	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
STEAM (IBR), STEAM CONDENSATE(IBR), BOILER FEED WATER (IBR), HP STEAM(IBR), HP CONDENSATE (IBR).

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D2D REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 335 GR.P11 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.1.25CR CL.42 FROM 16.000 TO 24.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	105.46	105.46	105.46	101.59	97.37	93.50	85.07	82.61	79.79	74.87	71.36	68.55	63.27	44.99	30.23

SERVICE :
STEAM (IBR) ABOVE 454 DEG C

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D34K REV : 0 GASKET MATERIAL :
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0
Press (Kg/sq. cm g)	66.40	66.40	66.40	52.70

SERVICE :
PROCESS TUBING - RO, CATALYST BLOW BACK (BASED ON LICENSOR PMS CLASS - LGP55)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : D36A REV : 0 GASKET MATERIAL : SP.WND SS316+PTFE+ I RING
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	104.05	104.05	94.91	89.28	89.28

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS - FLAMMABLE & NON-LETHAL, KILL GAS (BASED ON LICENSOR PMS CLASS - 1G4/1G4A)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D36K REV : 0 GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.750 TO 02.000

Temp (deg. C)	- 101.0	- 29.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0
Press (Kg/sq. cm g)	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38	52.38

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - 6G57)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	02.000
GLOBE	00.750	02.000
CHECK	00.750	02.000

PIPING MATERIAL CLASS : D40A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 36.000
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE REFRIGERANT, XYLENE, METHANOL, ETHYLENE REFRIGERANT, NH3, GAS FLARE, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D41K REV : 0

GASKET MATERIAL : SS316+GRAFIL+SS316 I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 10.000 TO 30.000
PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 196.0	38.0	93.0	120.0
Press (Kg/sq. cm g)	101.24	101.24	84.36	80.12

SERVICE :
MILD TO MODERATE CORROSIVE PROCESSES & HYDROCARBONS BELOW MINUS 45 DEG C

- FLAMMABLE, TOXIC/ NON TOXIC BUT NON LETHAL

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

PIPING MATERIAL CLASS : D42A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
CLEAN HYDROCARBONS(MIXTURE ETHYLENE/BUTENE) AT LOW TEMPERATURE (OR RISK OF LOW TEMP) -45 DEG C MINIMUM LIQUID BUTENE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	14.000
GLOBE	00.500	12.000
CHECK	00.500	14.000
BALL	00.500	14.000

PIPING MATERIAL CLASS : D42K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 12.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0
Press (Kg/sq. cm g)	98.40	98.40	87.20	78.70	72.06

SERVICE :
HYDROCARBONS, HP NITROGEN, CYCLIC PRESSURE (BASED ON LICENSOR PMS CLASS L6G5)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	12.000
GLOBE	00.750	12.000

PIPING MATERIAL CLASS : D4A REV : 0

GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600
PIPE MATERIAL : ASTM A 333 GR.6 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 671 GR.CC60 CL.32 FROM 16.000 TO 24.000

Temp (deg. C)	- 45.0	38.0	93.0	120.0	149.0	204.0
Press (Kg/sq. cm g)	98.07	98.07	92.79	91.27	89.64	86.47

SERVICE :
NON CORROSIVE PROCESS,FLAMMABLE / NON FLAMMABLE, NON LETHAL(BELOW -29 DEG C AND UPTO -45 DEG C) HYDROCARBONS,PROPYLENE, XYLENE, METHANOL, NH3, GAS FLARE, ETHYLENE, COMONOMER (1-BUTENE / 1-HEXENE), VENT TO FLARE, RECOVERED GAS, RECOVERED LIQUID ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000
BALL	00.500	16.000

Package : IPMCS
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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D54K REV : 0 GASKET MATERIAL : SS304+GRAFIL+SS304 I/O RING
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 04.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 101.0	38.0	65.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0
Press (Kg/sq. cm g)	51.70	51.70	58.00	51.70	51.70	51.70	51.70	51.70	51.70	51.70

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LPZ17)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	04.000
GLOBE	00.750	04.000
CHECK	00.750	04.000

PIPING MATERIAL CLASS : D55A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.750 TO 02.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	94.90	94.90	94.90	92.10	89.30

SERVICE :
HYDROGEN (BASED ON LICENSOR PMS CLASS - LGP31)

VALVE DETAILS

TYPE	FROM	TO
GLOBE	00.750	02.000
CHECK	00.750	02.000

PIPING MATERIAL CLASS : D5A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.32 FROM 16.000 TO 24.000
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	230.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	86.96

SERVICE :
HYDROGEN AND HYDROGEN BEARING HYDROCARBONS
- FLAMMABLE & NON-LETHAL.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	24.000
GLOBE	00.500	12.000
CHECK	00.500	24.000

PIPING MATERIAL CLASS : D69M REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP316/316L DU FROM 00.500 TO 06.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0
Press (Kg/sq. cm g)	101.24	101.24	87.18	78.74	72.06	67.14

SERVICE :
SPENT CAUSTIC

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000

PIPING MATERIAL CLASS : D81K REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 40.0	38.0	66.0	93.0	110.0	149.0
Press (Kg/sq. cm g)	101.24	101.24	92.80	84.37	81.69	75.57

SERVICE :
ALKYL, PRODIGYTM BMC CATALYST, MODIFIER D (BASED ON LICENSOR PMS CLASSES - 7E28 & 7G28).

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	02.000
BALL	00.500	02.000

Package : IPMCS
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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : D9A REV : 0 GASKET MATERIAL : SP.WND SS316+GRAFIL+ I RING

CORROSION ALLOWANCE : 03.00 MM
ANSI RATING : 600

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 30.000
PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 36.000 TO 36.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	104.05	104.05	95.60	92.09	88.92	84.71	79.79	77.33	74.52	71.35	58.00

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, PROCESS WET LIQUID DRAIN,.ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.250	24.000
GLOBE	00.250	12.000
CHECK	00.250	24.000

PIPING MATERIAL CLASS : F22A REV : 0 GASKET MATERIAL : SOFT IRON

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : SA-106/SA-106M GR.B FROM 00.500 TO 16.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE :
STEAM, CONDENSATE, BOILER BLOWDOWN, FEEDWATER DISCHARGE AND CHEMICAL FEED TO BOILER ((AS PER ASME SEC-I)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	16.000
CHECK	00.500	16.000

PIPING MATERIAL CLASS : F25A REV : 0 GASKET MATERIAL : SP.WND SS316L+GRAFIL+ I RING

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	191.0
Press (Kg/sq. cm g)	260.50	260.50	238.70	229.90	224.60

SERVICE :
CARBON MONOXIDE, REACTION KILL (BASED ON LICENSOR PMS CLASS - LGP36)

VALVE DETAILS

TYPE	FROM	TO
BALL	00.500	02.000

PIPING MATERIAL CLASS : F29K REV : 0 GASKET MATERIAL :

CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 600

Temp (deg. C)	- 46.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	175.80	175.80	175.80	175.80

SERVICE :
CHEMICALS (BASED ON LICENSOR PMS CLASS - LC51)

VALVE DETAILS

TYPE	FROM	TO

PIPING MATERIAL CLASS : F2A REV : 0 GASKET MATERIAL : SOFT IRON

CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500

PIPE MATERIAL : ASTM A 672 GR.B60 CL.22 FROM 16.000 TO 18.000
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	238.66	229.88	222.85	211.95	199.65	192.97	186.64	178.21	144.46

SERVICE :
STEAM AND BOILER FEED WATER (IBR), CONDENSATE (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : F2G REV : 0

GASKET MATERIAL : 5%CR 0.5%Mo
CORROSION ALLOWANCE : 01.50 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A 335 GR.P91 FROM 00.500 TO 14.000
PIPE MATERIAL : ASTM A 691 GR.P91 CL.42 FROM 16.000 TO 24.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	263.65	263.65	263.65	255.91	248.18	233.77	212.67	206.70	199.67	187.01	178.57	171.19	157.83	135.69	127.95	127.84

SERVICE :
VERY HIGH PRESSURE STEAM (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	08.000
GLOBE	00.500	08.000
CHECK	00.500	08.000

PIPING MATERIAL CLASS : F36A REV : 0

GASKET MATERIAL : SOFT IRON
CORROSION ALLOWANCE : 00.75 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 02.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	190.0
Press (Kg/sq. cm g)	196.85	196.85	196.85	196.85	196.85

SERVICE :
KILL GAS (BASED ON LICENSOR PMS CLASS - 1K6)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	02.000
GLOBE	00.500	02.000
CHECK	00.500	02.000
BALL	00.500	02.000

PIPING MATERIAL CLASS : F36K REV : 0

GASKET MATERIAL : SS 316L
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.500 TO 02.000

Temp (deg. C)	- 40.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	241.10	241.10	217.60	201.78

SERVICE :
MODIFIER C (BASED ON LICENSOR PMS CLASS - 7K6)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	02.000
GLOBE	00.500	02.000
CHECK	00.500	02.000
BALL	00.500	02.000
NEEDLE	00.500	02.000

PIPING MATERIAL CLASS : F55K REV : 0

GASKET MATERIAL : SS316L+GRAFIL+SS316L I/O RING
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 1500
PIPE MATERIAL : ASTM A312 GR.TP304/304L FROM 00.750 TO 02.000

Temp (deg. C)	- 40.0	38.0	93.0	135.0
Press (Kg/sq. cm g)	210.90	210.90	177.90	164.20

SERVICE :
HYDROGEN; KILL GAS (BASED ON LICENSOR PMS CLASS - L7K6D)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.750	02.000
GLOBE	00.750	02.000
CHECK	00.750	02.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : F81A REV : 0 GASKET MATERIAL : SOFT IRON
CORROSION ALLOWANCE : 00.75 MM PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 01.000
ANSI RATING : 1500

Temp (deg. C)	- 29.0	38.0	66.0
Press (Kg/sq. cm g)	175.77	175.77	175.77

SERVICE :
ALKYLS,ADDITIVES,CHEMICALS,CHLORINATED CHEMICALS (THIS SPECIFICATION IS INTENDED FOR NEAT ALKYLS AND OTHER NEAT PYROPHORIC MATERIALS ONLY FOR 1/2 INCH AND 3/4 INCH SIZES.) (BASED ON LICENSOR PMS CLASS - 1K8)

VALVE DETAILS

TYPE	FROM	TO
CHECK	00.500	01.000
BALL	00.500	01.000

PIPING MATERIAL CLASS : F92K REV : 0 GASKET MATERIAL : SS 316
CORROSION ALLOWANCE : 00.00 MM PIPE MATERIAL : ASTM A 358 TP304 CL.1 FROM 14.000 TO 16.000
ANSI RATING : 1500 PIPE MATERIAL : ASTM A 312 TP304 FROM 00.500 TO 08.000

Temp (deg. C)	- 29.0	93.3	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0
Press (Kg/sq. cm g)	253.09	210.92	189.12	174.71	163.81	155.38	151.86	148.34	145.20	142.72	139.20	136.74	134.28	124.44

SERVICE :
CORROSIVE SERVICE, PHOSPHATE SERVICE

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	16.000
GLOBE	00.500	04.000
CHECK	00.500	16.000

PIPING MATERIAL CLASS : F9A REV : 0 GASKET MATERIAL : SOFT IRON
CORROSION ALLOWANCE : 03.00 MM PIPE MATERIAL : ASTM A 106 GR.B FROM 00.500 TO 14.000
ANSI RATING : 1500 PIPE MATERIAL : ASTM A 672 GR.B60 CL.12 FROM 16.000 TO 24.000

Temp (deg. C)	- 29.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0
Press (Kg/sq. cm g)	260.49	260.49	237.28	230.61	222.87	210.57	192.29	188.77	187.37	177.17	144.83

SERVICE :
MILD TO MODERATE CORROSIVE PROCESS LIQUID, VAPOUR & GAS, FLAMMABLE/NON FLAMMABLE & NON LETHAL - HVGO,SLOP, DISTILLATE, RCO, DIESEL, KEROSENE,LVGO, VBTAR, TCTAR, HYDROCARBON, ETC.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

PIPING MATERIAL CLASS : G22G REV : 0 GASKET MATERIAL : 5%CR 0.5%Mo
CORROSION ALLOWANCE : 01.50 MM PIPE MATERIAL : SA-335/SA-335M GR.P91 FROM 00.500 TO 16.000
ANSI RATING : 2500

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	439.40	439.40	439.40	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38	213.02	212.87

SERVICE :
SUPER HIGH PRESSURE STEAM (IBR) & ASME SEC-I

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

PIPING MATERIAL CLASS : G2G REV : 0 GASKET MATERIAL : 5%CR 0.5%Mo
CORROSION ALLOWANCE : 01.50 MM PIPE MATERIAL : ASTM A 335 GR.P91 FROM 00.500 TO 12.000
ANSI RATING : 2500 PIPE MATERIAL : ASTM A 691 GR.P91 CL.42 FROM 16.000 TO 30.000

Temp (deg. C)	0.0	38.0	93.0	149.0	204.0	260.0	316.0	343.0	371.0	399.0	427.0	454.0	482.0	510.0	538.0	540.0
Press (Kg/sq. cm g)	439.40	439.40	439.40	426.75	413.39	389.49	354.34	344.84	332.54	311.45	297.39	285.44	263.29	226.38	213.02	212.87

SERVICE :
SUPER HIGH PRESSURE STEAM (IBR)

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	04.000
GLOBE	00.500	04.000
CHECK	00.500	04.000

Package : IPMCS
Report No. : 56

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Client : BPCL	**Dept./Sect.** 16/43
Project : MPMC & EPCM-1 FOR BPREP	**Job No.** : B957
Location : BINA, MADHYA PRADESH	

PIPING MATERIAL CLASS : J2A REV : 0 GASKET MATERIAL : BUTYL RUBBER
PIPE MATERIAL : ASTM A 106 GR.B(GALV) FROM 00.500 TO 12.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	10.55	10.55	10.55

SERVICE :
DRINKING WATER (ABOVE GROUND / UNDER GROUND), FIRE WATER-SPRINKLER SYSTEM U/G ,A/G AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM.

VALVE DETAILS

TYPE	FROM	TO
GATE	00.500	06.000
GLOBE	00.500	06.000
CHECK	00.500	06.000

PIPING MATERIAL CLASS : J95A REV : 0 GASKET MATERIAL : BUTYL RUBBER
PIPE MATERIAL : IS-3589 GR.410 (GALV) FROM 16.000 TO 16.000
PIPE MATERIAL : ASTM A 106 GR.B(GALV) FROM 00.500 TO 14.000
CORROSION ALLOWANCE : 00.00 MM
ANSI RATING : 150

Temp (deg. C)	0.0	38.0	65.0
Press (Kg/sq. cm g)	18.90	18.90	18.90

SERVICE :
FIRE WATER-SPRINKLER SYSTEM, WATER & FOAM SOLUTION (U/G& A/G) AND INSTRUMENT AIR FOR DELUGE VALVE PNEUMATIC DETECTION SYSTEM

VALVE DETAILS

TYPE	FROM	TO

Package : IPMCS
Report No. : 56

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पाइपिंग के अध्वंसात्मक परीक्षण की आवश्यकताओं हेतु मानक विनिर्देश

JOB SPECIFICATION FOR NON DESTRUCTIVE EXAMINATION REQUIREMENTS OF PIPING

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
D	05.02.26	REVISED & ISSUED AS JOB SPECIFICATION	SRG	PK	SNH
C	01.01.25	REVISED & ISSUED AS JOB SPECIFICATION	SRG	PK	SNH
B	24.12.24	REVISED & ISSUED AS JOB SPECIFICATION	SRG	PK	SNH
A	19.11.24	ISSUED AS JOB SPECIFICATION	SRG	PK	SNH

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Abbreviations:

DP/LP	:	Dye/Liquid Penetrant
MP	:	Magnetic Particle
CS	:	Carbon Steel
AS	:	Alloy Steel
SS	:	Stainless Steel
ASTM	:	American Society for Testing & Materials
ASME	:	American Society of Mechanical Engineers
IBR	:	Indian Boiler Regulations
PMS	:	Piping Material Specification

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1.0 GENERAL

1.1 Scope

This specification covers the general requirements for non destructive examination of shop & field fabricated piping.

1.2 Related Codes & Engineering Standards

Referred codes / standards are as follows. Latest editions of the Codes/Standards referred to shall be followed.

a) ASME Boiler & Pressure Vessel Codes, Section V & VIII (Div.1) including addenda.

b) ASME B31.3

c) ASME B16.5

d) ASME B16.34

e) Job Piping Material Specification, B957-6-44-0005

f) Welding Specification Charts for Piping Classes, B957-999-06-41-WSC-0001

g) Standard Specification for Fabrication & Erection of Piping 6-44-0012

h) ASTM E10

i) Welding Specification for Fabrication of Piping, 6-77-0001 & B957-999-06-41-WSP-0001

j) Design Guide for Radiography Requirements, 8-77-0010

k) Indian Boiler Regulations (IBR)

2.0 VISUAL EXAMINATION

2.1 Weld shall be visually inspected wherever accessible in accordance with the following requirements:

a)	Internal misalignment	1.5 mm or less
b)	Cracks or lack of fusion	not permitted
c)	Incomplete penetration	Depth shall not exceed the lesser of 0.8mm or 0.2 times thickness of thinner component joined by butt-weld. The total length of such imperfections shall not exceed 38 mm in any 150 mm of weld length.
d)	Surface porosity and exposed slag inclusions (For nom. wall thickness 4.7 mm and less)	not permitted

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e)	Concave root surface (Suck up)	For single sided welded joints, concavity of the root surface shall not reduce the total thickness of joint, including reinforcement, to less than the thickness of the thinner of the components being joined.
f)	Weld ripples irregularities	2.5 mm or less.
g)	Lack of uniformity in bead width	2.5 mm or less.
h)	Lack of uniformity of leg length	2.5 mm or less.
i)	Unevenness of bead	2.0 mm or less.
j)	Weld undercutting	0.8 mm or 1/4 thickness of thinner components joined by butt weld, whichever is less. (shall be smooth finished)
k)	Overlap	1.5 mm or less
l)	Bead deflection	2.5 mm or less

m) External weld reinforcement and internal weld protrusion (when backing rings are not used) shall be fused with and shall merge smoothly into the component surfaces. The height of the lesser projection of external weld reinforcement or internal weld protrusion from the adjacent base material surface shall not exceed the following limits:

Wall thickness of thinner component joined by butt weld (mm)	Weld reinforcement or internal weld protrusion (mm) max
6.4 and under	1.6
Over 6.4 -12.7	3.2
Over 12.7 -25.4	4.0
Over 25.4	4.8

n) Throat thickness of fillet welds:

Nominal thickness of the thinner component x 0.7 or more.

o) Flattening

Flattening of a bend, as measured by difference between the nominal outside diameter and minimum or maximum diameter at any cross section shall not exceed 5 % of the nominal outside diameter of pipe.

p) Reduction of wall thickness

Reduction of wall thickness of a bend, as measured by difference between the nominal thickness and minimum thickness shall not exceed 10 % of the nominal wall thickness of pipe.

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2.2 Welds having any of imperfections which exceed the limitations specified in various clauses of 2.1 shall be repaired by welding, grinding or overlaying etc. Number of times of repair welding for the same weld, however shall conform to applicable notes to Table 1- Note 6(b)b.5.

3.0 NON DESTRUCTIVE EXAMINATION

3.1 The type and extent of weld examination shall be in accordance with Table-1. All visual and supplementary methods of girth weld examination shall be in accordance with ASME B31.3 & the requirements of this standard specification.

3.2 Welds between dissimilar materials shall be examined by method & to the extent required for the material having the more stringent examination.

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4. TABLE-1 (with applicable notes)

TABLE 1 : CLASS, TYPE & EXTENT OF WELD EXAMINATION

INSPECTION CLASS: I

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P.NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELD (NOTE 1)	FAB. WELDS OF MITRES / REDUC.
1	2	3	4	5	6	7	8	9	10	11	12	13
I	CATEGORY 'D' FLUID SERVICE	CARBON STEEL	1	0 TO 186	150# UPTO 10.55 KG/CM^2	**A3A, A39A, J2A, A4Y, A5Y, A91A, A95A, A96A**	a) VISUAL	100%	100%	100%	100%	100%
		AUSTENIC S.S.	8	- 29 TO 186		**A3K**						
		HDPE	---	- 20 TO 50		**A1Z, A4Z, A5Z**	b) LP (NOTE 4, 6, 9)	---	---	---	5%	10%
		CUPRO NICKEL	34	- 29 TO 60								

REMARKS FOR ABOVE TABLE :

1. LP TEST NOT APPLICABLE TO NON-METALLIC CLASSES.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: II

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG. C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELD (NOTE 1)	FAB. WELDS OF MITRES/ REDUC.
1	2	3	4	5	6	7	8	9	10	11	12	13
	a) ALL SERVICES COVERED UNDER INSPECTION CLASS-I, BUT, EXCEEDING CATAGORY 'D' PR./TEMP LIMITATIONS. b) ALL SERVICES OTHER THAN THOSE COVERED UNDER INSPECTION CLASS-I BUT NON-TOXIC, NOT SUBJECTED TO SEVERE CYCLIC CONDITIONS. c) TOXIC, NON-LETHAL & FLAMMABLE. d) FLAMMABLE / NON FLAMMABLE & TOXIC / NON-TOXIC; NOT SUBJECT TO SEVERE CYCLIC CONDITIONS	CARBON STEEL	1	- 29 TO 427	150# TO 600#	**A1A,B1A, D1A, A6A, B6A, A7A, A8A, A9A, B9A, D9A, A11A, A13A, B13A, A15A, A20A, A32A, B32A, B28A, A71A, A83A, A41A, B41A, B72A**	a) VISUAL	100%	100%	100%	100%	100%
							b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	5%	---	---	---	20%
							c) MP / LP (NOTE 4, 6, 10, 11, 16)	---	5%	---	5%	20%
		LTCS		-45 TO 204		**A4A, B4A, D4A, ~~A41A~~, A42A, ~~B41A~~, B42A, D42A, A40A, B40A, D40A**	d) HARDNESS	NOTE 7	NOTE 7	NOTE-7	NOTE-7	NOTE-7
		AUSTENITIC STAINLESS STEEL	8	-29 TO 500		**A1K, B1K,D1K, A6K, B6K, A11K, A1M,B1M,B3M, A1N,B1N, B6N, A21K, A23K, A24K, A28K, A28M, D21K, D23M, A71K, A92K, B92K**						

REMARKS FOR ABOVE TABLE :

1. EXTENT OF HARDNESS TEST FOR A11A IS 100%.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
3. NOTE- 7 FOR HARDNESS IS NOT VALID FOR P. NO. 8.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH -MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III	FIRE WATER AND IBR SERVICES.	CARBON STEEL (FIRE WATER)	1	- 29 TO 427	150# TO 600#	A33A, A33Y, A94A, A97A, J95A	a) VISUAL	100%	100%	100%	100%	100%
		CARBON STEEL (IBR)				A2A, B2A, D2A	b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	10%	---	---	---	50%
							c) LP / MP (NOTE 4,6,11)	---	10%	---	10%	---
							d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7

REMARKS FOR ABOVE TABLE :

1. FOR IBR SERVICE A2A, B2A & D2A NOTE- 8 IS ALSO APPLICABLE.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
3. FOR A33A & A33Y FIRE WATER SERVICE, NOTE-12 IS ALSO APPLICABLE.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH -MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS.	C - 0.5 Mo STEEL. 0.5 Cr - 0.5 Mo STEEL C - 0.5 Mo STEEL (IBR)	3	ABOVE -29	150# TO 600#		a) VISUAL b) RADIOGRAPHY (NOTE 5, 6, 14, 15) c) LP / MP (NOTE 4,6,11) d) HARDNESS	100% 20% --- NOTE 7	100% --- 20% NOTE 7	100% --- 20% NOTE 7	100% --- 20% NOTE 7	100% 50% --- NOTE 7

REMARKS FOR ABOVE TABLE :

1. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH -MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS.	1 TO 3 Cr Mo. STEEL.	4,5A	ABOVE -29	150# TO 600#	**B1D, D1D B1E, B4D, B72D**	a) VISUAL	100%	100%	100%	100%	100%
							b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	20%	---	---	---	50%
		1 - 3 Cr Mo STEEL (IBR)	4,5A			**D2D, B20D**	c) LP / MP (NOTE 4, 6, 11)	---	100%	100%	100%	---
		NI ALLOYS	43			**D20Q**	d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7

REMARKS FOR ABOVE TABLE :

1. FOR IBR SERVICE B20D, D2D & D20Q NOTE- 8 IS ALSO APPLICABLE.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS.	3.5 Ni STEEL	9B	- 80 TO 120	150# TO 600#		a) VISUAL	100%	100%	100%	100%	100%
							b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	20%	---	---	---	50%
							c) LP / MP (NOTE 4,6,10,11)	---	10%	---	10%	---
							d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7

REMARKS FOR ABOVE TABLE:

1. NOTE- 7 FOR HARDNESS IS NOT VALID FOR P. NO. 9B.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH -MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	ALL GENERAL SERVICES EXCEPT THOSE SUBJECT TO SEVERE CYCLIC CONDITIONS	ALUMINIUM & ALUMINIUM BASE ALLOY	21 TO 25	ALL	150#		a) VISUAL	100%	100%	100%	100%	100%
		COPPER & COPPER BASE ALLOY	31				b) RADIOGRAPHY (NOTE 5,6, 14, 15)	20%	---	---	---	50%
		ALUMINIUM BRONZE	35				c) LP / MP (NOTE 4,6,10,11)	---	20%	---	20%	---
		OTHER NON FERROUS ALLOYS	---									

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	SPECIAL SERVICES (CAUSTIC)	CARBON STEEL	1	ALL	150# TO 600#	**A19A, B19A, D19A, A69A, A99A, B99A, B20Y**	a) VISUAL	100%	100%	100%	100%	100%
							b) RADIOGRAPHY (NOTE 5,6)	20%	---	---	---	50%
	SPECIAL SERVICES (O, H)	CARBON STEEL			150# TO 300#	**B5A, B55A**	c) LP / MP (NOTE 4,6,10,11)	10%	20%	10%	20%	---
							d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7
	SPECIAL SERVICES (CAUSTIC)	AUSTENITIC STAINLESS STEEL	8		150# TO 600#	**A69M, B69M, D69M**						

REMARKS FOR ABOVE TABLE :

1. EXTENT OF HARDNESS TEST FOR CLASSES B5A, B55A, A19A, B19A & D19A IS 100%.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: III (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
III (CONTD)	SPECIAL SERVICES (NACE)	CARBON STEEL	1	ALL	150# TO 600#	**A16A, B16A, D16A, ~~A61A, B61A, B62A, A62A, A63A~~**	a) VISUAL	100%	100%	100%	100%	100%
							b) RADIOGRAPHY (NOTE 5,6)	20%	---	---	---	50%
							c) LP / MP (NOTE 4,6,10,11, 18)	100%	100%	10%	100%	100%
		AUSTENITIC STAINLESS STEEL	8		150# TO 600#	**A60K, A60N, B60K, B60N**	d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7

REMARKS FOR ABOVE TABLE :

1. EXTENT OF HARDNESS TEST FOR CLASSES A16A, ~~A61A, A62A~~, B16A & D16A IS 100%.
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: IV

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH -MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
IV	ALL SERVICES OTHER THAN SPECIAL SERVICES (O,H)	CARBON STEEL	1	ALL	ABOVE 600#	**E1A, F1A, E9A, F9A, E19A, F19A**	a) VISUAL	100%	100%	100%	100%	100%
		LTCS				**E40A**	b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	100%	---	---	---	100%
		CARBON STEEL (IBR)				**E2A, F2A**	c) LP / MP (NOTE 4,6,10,11)	---	100%	10%	100%	---
		CARBON STEEL (IBR) ASME SEC-I				**F22A**	d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7

REMARKS FOR ABOVE TABLE :

1. FOR IBR SERVICE E2A, F2A & F22A NOTE- 8 IS ALSO APPLICABLE.
2. EXTENT OF HARDNESS TEST FOR CLASSES E19A, F19A IS 100% .
3. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: IV (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
IV (CONTD)	ALL GENERAL SERVICES.	C - 0.5 Mo STEEL	3	ALL	ABOVE 600#	--	a) VISUAL	100%	100%	100%	100%	100%
		5 Cr - 9 Cr Mo STEEL	5B		150# TO 600#	A4F, A4G, B3F, B4F, B4G, D23F	b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	100%	---	---	---	100%
		13 Cr (TYPE-410 SS)	6		ALL	--						
		KILLED CARBON STEEL & LTCS	1	UPTO - 45	ABOVE 600#	--	c) LP / MP (NOTE 4,6,10,11)	100%	100%	100%	100%	100%
		1 TO 3 Cr, 9Cr-1Mo-V STEEL (IBR)	4,5A, 15E	ALL		F2D, F2G, G2D, G2G	d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7
		1 TO 3 Cr, 9Cr-1Mo-V STEEL (IBR) ASME SEC-I	4,5A, 15E	ALL		F22D, G22D, G22G						

REMARKS FOR ABOVE TABLE :

1. FOR IBR SERVICE F2D, F2G, F22D, G2D, G22D, G2G & G22G NOTE- 8 IS ALSO APPLICABLE..
2. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
3. FOR F2G, G22G & G2G, ALL WELDS FOR WHICH RADIOGRAPHY HAS BEEN DONE, SHALL ALSO BE SUBJECTED TO 100% LP/MP EXAMINATION.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: IV (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
IV (CONTD)	SPECIAL SERVICES (O, H) , BENZENE ETC.	CARBON STEEL	1	ALL	ABOVE 300#	**D5A, E5A, F5A, F25A, D55A, D52A, A87A,**	a) VISUAL	100%	100%	100%	100%	100%
	SPECIAL SERVICES (NACE)				150# TO 600#	**A61A, B61A, B62A, A62A, A63A**	b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	100%	---	---	---	100%
	SPECIAL SERVICES (TEAL, HYDROGEN-ECU)				ALL	**A43A, A44A, A45A A46A, B43A,B44A, B45A, B46A, A21A, B21A, B52A**	c) LP / MP (NOTE 4,6,10,11, 18)	10%	100%	10%/ 100% REMARKS -4	100%	---
	SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS					**A24A, B24A, B27A, D28A**	d) HARDNESS	NOTE 7	NOTE 7	NOTE 7	NOTE 7	NOTE 7
	SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS	0.5 TO 9 CR Mo STEEL	3, 4, 5A, 5B	ALL	ALL	--						
	SPECIAL SERVICES (NACE, O, H, CAUSTIC)					**B5D, D5D, D5E, E5E, D52D**						
	SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS	13 CR STEEL (TYPE 410SS)	6			--						
	SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS.	3.5 NI STEEL	9B			--						
	SPECIAL SERVICES (NACE, O, H, CAUSTIC)					--						
	SPECIAL SERVICES (NACE, O, H, CAUSTIC)	NI ALLOYS	41, 42, 43			~~**A99P**~~**, B21Q**						
	ALL SERVICES		45			**A21P, B21P**						

REMARKS FOR ABOVE TABLE:

1. NOTE-7 FOR HARDNESS IS NOT VALID FOR P.NO.9B.
2. EXTENT OF HARDNESS TEST FOR CLASS A61A, A62A, A63A, B61A, B62A, D5A, E5A F25A, D55A, D52A AND F5A IS 100%.
3. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.
4. ATTACHMENT WELDS SHALL BE 100% LP/MP TESTED FOR ALLOY STEEL CLASS.

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TABLE 1: CLASS, TYPE & EXTENT OF WELD EXAMINATION (CONTD.)

INSPECTION CLASS: IV (CONTD.)

INSPN. CLASS	SERVICE	MATERIAL (NOTE 3)	P. NO.	TEMP. DEG.C	PRESS. CLASS B16.5/ B16.34	APPLICABLE PIPING CLASS	TYPE OF EXAMINATION	TYPE OF WELD EXAMINED				
								GIRTH BUTT WELD	SOCKET WELD (NOTE 2)	ATTACH-MENT WELD	FAB. BRANCH WELDS (NOTE 1)	FAB. WELDS OF MITRES / REDUC.)
1	2	3	4	5	6	7	8	9	10	11	12	13
IV (CONTD)	SERVICES SUBJECT TO SEVERE CYCLIC CONDITIONS.	AUSTENITIC STAINLESS STEEL	8	ALL	ALL	D42K, B46K,	a) VISUAL	100%	100%	100%	100%	100%
	LOW TEMP. SERVICE			BELOW - 45	150# 300# & 600#	A2K, B2K, D2K, A42K, B42K, D54K, A41K, B41K, D41K	b) RADIOGRAPHY (NOTE 5, 6, 14, 15)	100%	--	--	--	100%
					ABOVE 600#	E41K						
	GENERAL SERVICES			ALL	ABOVE 600#	F92K	c) LP (NOTE 4, 6, 10, 11, 16)	--	100%	10%	100%	--
	HIGH TEMP. SERVICES			> 500	ALL	B4K, B5K	d) HARDNESS	-	-	-	-	-
	SPECIAL SERVICES (O,H,) ETC.			ALL	ALL	B5M, A44K, A45K, B44K, B45K, F55K						
	SPECIAL SERVICES (TEAL)			ALL	ALL	A20K, B20K, D20K						

REMARKS FOR ABOVE TABLE :

1. MITRES & FABRICATED REDUCERS ARE PERMITTED ONLY IF SPECIFIED IN PMS.

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Applicable Notes to Table-1

1. Branch welds shall consist of the welds between the pipe & reinforcing element (if any), nozzles & reinforcing element and the pipe & nozzle under the reinforcing element. Reinforcing element to be interpreted as pads, saddles, weldolets, sockolets etc.

2. Seal welds of threaded joints shall be given the same examination as socket welds.

3. Unless specifically stated, all materials shall be for "Non-IBR" service.

4. Magnetic Particle & the Liquid Penetrant method of examination shall be in accordance with Section V of the ASME Boiler and Pressure Vessel Code, Article VII and VI respectively. The entire area of the accessible finished weld surface shall be examined. Selected root runs, subject to a maximum of 10%, before finished weld, may also be examined, at the discretion of the engineer-in-charge.

   a) Wherever MP / LP testing is specified, either MP or LP test may be used. But wherever only MP test is specified, LP method of examination may be used only if MP examination is impracticable in the field as concurred by EIL site-in charge.

   b) "Random 5%" of Liquid Penetrant / Magnetic Particle test shall mean testing, by applicable test, one weld for each twenty welds or less made by the same welding procedure. "Random 10%" shall mean testing, by applicable test, one weld for each ten welds or less made by the same welding procedure. Similarly "Random 20%" shall mean testing, by applicable test, one weld for each five welds or less made by the same welding procedure. The welds to be examined in each designated lot shall include the work product of each welder or welding operator whose welds are part of the lot.

   c) When Liquid Penetrant examination is specified, the surface shall be free of peened discontinuities.

   d) Inspection shall be performed in the welds excluding those for which Radiography has been done.

   e) Girth weld, branch weld, attachment weld & socket weld of 3-1/2% Ni steel shall be Liquid Penetrant tested only when welded with austenitic material where MP test has been specified.

5. Radiography (Note-14,15):

   a) "Random 5%, 10% or 20% Radiography" shall mean examining not less than one from each 20 welds or less in case of "Random 5% Radiography", not less than one from each 10 welds or less in case of "Random 10% Radiography", not less than one from each five welds or less in case of "Random 20% Radiography" made by the same welding procedure. The welds to be examined in each designated lot shall include the work product of each welder or welding operator whose welds are part of the lot. Irrespective of percentage, no. of welds to be radiographed shall be minimum 1. However first two welds made by each welder shall also be radiographed in case of "Random Radiography". Welds selected for examination shall not include flange welds and shall be radiographed for their entire length. However, where it is impossible or impracticable to examine the entire weld length of field welds for either random or 100% Radiography, and if the same impossibility is agreeable to EIL site-in- charge, then a single 120 deg. exposure of the weld length may be given a Magnetic Particle test or Liquid Penetrant test.

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However in such cases for ferro-magnetic materials, only MP test shall be acceptable for classes higher than 600#.

b) In-process examination shall not be substituted for any required radiographic examination.

c) Number of radiographs per one circumferential weld shall be as per ASME Sec.V Articles 2 and 22.

6. When radiography or other non destructive inspection is specified, acceptance criteria for repairs or defects shall be as follows:

a) In case of 100% examination, any unacceptable weld shall be repaired and reinspected.

b) If required random examination reveals a defect requiring repair, then:

b.1 Two additional examinations of same type shall be made of the same kind of item (if welded joint, then by the same welding procedure and same welder or welding operator).

b.2 If the group of items examined as required by b.1 above is acceptable, the items requiring repair shall be repaired or replaced and reexamined as required and all items represented by this additional examination shall be accepted.

b.3 If any of the items examined as required by b.1 above reveals a defect requiring repair, two further comparable items shall be examined for each defective item found by examination.

b.4 If all the items examined as required by b.3 are acceptable, the items requiring repair shall be repaired or replaced and reexamined as required, and all items represented by this further examination shall be accepted.

b.5 Number of times repair welding could be done for the same weld before acceptance shall be as follows:

Material	**No. of times repair welding is allowed**
C.S. upto 300 #	3 or less
C.S. above 300 #	2 or less
Killed steel	2 or less
Low alloy steel	2 or less
Austenitic S.S.	2 or less
3.5 Ni steel	2 or less
Al & Al base alloy	2 or less
Cu & Cu base alloy	2 or less
Others	2 or less

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b.6 Welds not found acceptable for allowed number of times of repair as per b.5 above shall be replaced and reexamined.

b.7 If any of the items examined as required by b.4 above reveals a defect requiring repair, all items represented by these examinations shall be either:

- repaired or replaced and reexamined as required.
- fully examined and repaired or replaced as necessary, and reexamined as necessary.

7. Hardness Test:

a) Hardness test shall be in accordance with ASTM specification E10. Hardness tests of the heat affected zone shall be made at a point as near as practicable to the edge of the weld. One test per weld shall be performed.

b) Hardness test where specifically called out in Table-1 of this specification or in PMS, shall be carried out irrespective of thickness and to the extent (%age) as mentioned therein.

c) All welds which are given heat treatment shall be hardness tested. Hardness test shall be performed after final heat treatment.

d) A minimum of 10% of welds, hot bends, and hot formed components in each furnace heat treated batch and 100% of those which are locally heat treated shall be hardness tested.

e) Hardness test requirement not covered in this specification shall be as per Engineering Specifications.

f) The hardness limit applies to the weld and heat affected zone. Following hardness values shall be maintained unless otherwise mentioned in Job specification :

Base Metal Group	**Hardness (BHN/RC)**
CS	200 BHN Max.
Cr Upto 2%	225BHN max.
Cr 2.25%-10%	241BHN max.
18/8 SS (NACE)	RC22 max.
9CR-1MO-V	190 BHN (min.)-250 BHN (max.)

g) In case hardness values are mentioned in both Welding Specification Charts for Piping Classes, (B957-999-06-41-WSC-0001) & table given in Note-7(f), the lower of the two values shall be applicable.

8. For IBR service lines, following IBR requirements shall apply in addition to the notes 4, 5, 6, 7, 12 and Table 1. In case of conflict between above notes and these requirements, the more stringent ones shall apply. IBR piping shall be erected of IBR inspector approved material and

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construction procedure. Erected piping shall be hydrotested, inspected and approved by IBR inspector.

a) Piping over 102 mm (4") bore:

10% of welds made by each welder on a pipeline with a minimum of two welds per welder, selected at random, shall be subjected to Radiography.

b) Piping 102 mm (4") bore and under, but not less than 38 mm (1-1/2") bore:

Two percent of welds made by each welder on a pipeline with a minimum of one weld per welder, selected at random, shall be subjected to Radiography or may be cut for visual examination and tests.

c) Piping less than 38 mm (1.5") bore:

Special tests are not normally required but 2% of welds by each welder on a pipe line may be cut out from the pipeline for the visual examination and bend tests.

d) Retests:

If any test specimen is unsatisfactory, two further weld specimens for retests shall be selected from the production welds and subjected to tests. In the event of failure of any retest specimens, the production welds carried out by this welder subsequent to the previous test shall be given special consideration.

9. For fabricated fittings LP test shall be done on the final pass of welding only, in addition to visual examination.

10. For mitres and fabricated reducers, LP / MP test shall be done on root pass in addition to Radiography applicable to circumferential joint of respective piping class.

11. For branch connections, LP/MP test shall be done on root pass and final pass.

12. 10% of the butt weld joints shall be radiographed, however, 50% of these butt weld joints shall be field weld joints.

13. For lined specs, testing (MP/LP/Radiography etc.) shall be performed before lining.

14. Digital/Close Proximity Radiography are also acceptable along with Conventional Radiography with prior approval of Owner/Engineer-in-charge. The same shall be performed in accordance with Welding Specification for Fabrication of Piping.

15. In place of Radiography, Automated Ultrasonic Testing (AUT) as per Welding specification for Fabrication of Piping is also acceptable subject to prior approval of Owner/Engineer-in-charge.

16. LP test is to be performed for Austenitic stainless steel, regardless of MP test specified.

17. For all fluid services, surfaces where attachment welds have been removed shall be visually examined and shall show no evidence of cracking, lack of fusion, or surface porosity.

Where temporary attachments are made on P-No. 4, P-No. 5A, P-No. 5B, and P-No. l5E materials, the surfaces shall also be examined by the MP/ LP methods.

18. All joints including butt weld joints for A16A, A61A, A62A, B16A and D16A and any other NACE classes shall be wet fluorescent magnetic particle tested. Percentage of wet fluorescent

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magnetic particle testing of butt weld joints shall be 100% and this testing shall be in addition to radiography.

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JOB SPECIFICATION
FOR
INSULATION SYSTEM OF HP, MP & LP STEAM LINE
(SMMS)

PROJECT : **MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BREP)**

CLIENT : **BHARAT PETROLEUM CORPORATION LIMITED**

PMC : **ENGINEERS INDIA LIMITED**

JOB NO. : **B957**

Rev. No	Date	Purpose	VT Prepared by	PP Checked by	PS Approved by
A	24.12.2025	ISSUED FOR TENDER			

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1.0 INTRODUCTION

Bharat Petroleum Corporation Limited (BPCL), Bina Refinery (BR) has embarked on Petrochemical Diversification Plan and as a part of further expansion of Petrochemical portfolio, it is intended to set up world scale Ethylene Cracker & Associated Units and Ethylene and Propylene based Petrochemical units for its diversification to Petrochemicals along with expansion of its refinery capacity to about 11 MMTPA.

1.1 Scope

Intent of this specification is to outline the minimum technical requirements for insulation of HP, MP and LP steam lines. Based on standards and specifications, appended in the tender, the contractor shall select appropriate insulation materials, develop insulation drawings, application procedures, quality control procedures, supply and install insulation meeting specified technical requirements

Aspects for HSE for execution of the job shall be separately addressed by the contractor meeting requirements of health, safety and environment practices of BPCL.

1.2 Reference Codes and Standards

Following standards shall form part of this specification.

ASTM A167	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C165	Measuring Compressive Properties of Thermal Insulations
ASTM C177	Standard Test Method for steady-state heat flux measurement and thermal transmission properties by means of the guarded-hot plate apparatus
ASTM C203	Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C302	Test Method for Dimensions and Density of Preformed Pipe-Covering-Type Thermal Insulation
ASTM C303	Test Method for Dimensions and Density of Preformed Block and Board−Type Thermal Insulation
ASTM C356	Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat
ASTM C421	Standard Test Method for Tumbling Friability of Preformed Block-Type and Preformed Pipe-Covering-Type Thermal Insulation
ASTM C446	Standard Test Method for Breaking Load and Calculated Modulus of Rupture of Preformed Insulation for Pipes
ASTM C474	Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction
ASTM C533	Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C591	Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C871	Standard test method for chemical analysis of thermal insulation materials for leachable chlorides, fluorides , silicate and sodium ions.
ASTM C1616	Standard Test Method for Determining the Moisture Content of Organic and Inorganic Insulation Materials by Weight
ASTM C1729	Standard Specification for Aluminum Jacketing for Insulation
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

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ASTM D903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1000	Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D1475	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1621	Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D6226	Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Material
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials
ASTM F1249	Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
SSPC-SP-6	Steel Structure Painting Council Standard for surface preparation
IS 5688	Methods of test for preformed block-type and pipe covering type thermal insulation
IS 9428	Preformed Calcium Silicate Insulation (for temperature up to 950°C

1.3 Specific abbreviations

Term	Definition
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BPCL	Bharat Petroleum Corporation Limited
CNC	Computer Numerical Control
EIL	Engineers India Limited
HCFC	Hydrochlorofluorocarbons
HSE	Health and Safety Executive
HP	High Pressure
IS	Indian Standard
ITP	Inspection & Test Plan
LP	Low Pressure
MOC	Material of Construction
MP	Medium Pressure
MSDS	Material Safety Data Sheet
PET	Polyethylene terephthalate
PIR	Rigid Polyisocyanurate
PMC	Project Management Consultant
QAP	Quality Assurance Plan
SSPC	Society for Protective Coatings
VOC	Volatile organic content

2.0 CONFLICTS & DIFFERENCES

2.1 In case of difference arises between Project Specifications and Codes & Standards, the following order of precedence shall be considered:

a) EIL Job specification for insulation system of HP, MP & LP steam lines (B957-999-06-43-IL02)
b) Applicable International Codes and Standards
c) Proven references of design of Utility boilers in similar service
d) Approved drawings, documents prepared by contractor

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e) BPCL HSE Management Systems and Standards, BPCL Codes and Standards
f) International Oil & Gas Industry Codes, Standards, and Recommended practices (all where specified in above or, where none of the above is applicable, as proposed by Contractor and approved by Company).

2.2 In the event of an inconsistency, conflict, or discrepancy between any of the standards, specifications and regulatory requirements noted herein, the most stringent and safest requirement applicable to the project will prevail. Contractor shall be responsible to provide its own interpretation of the most stringent requirement; in writing; for EIL/BPCL review and approval before proceeding with procurement / application of insulation. Any technical deviation shall be sought by the contractor only through the concession request format, however, EIL/BPCL decision shall be final.

2.3 Documentation dates

Requirements of certificates / test reports, if any that specifies a time period in this specification, bid due date shall be referred for determining the validity of such certificate / test report.

3.0 INSULATION DESIGN

HP, MP and LP steam line insulation system shall consist of multilayer insulation applied with joint sealants, protected from moisture/ water vapor ingress by multiplex foil / Butyl wrap and covered with metal cladding.

3.1. Insulation system and thickness

Steam line insulation system, materials selection and thickness shall be as per line list/ P&IDs.

3.2. Extent of insulation

a) Instrument lead lines, branch lines, instrument connections etc. shall be insulated up to a length of at least four (4) times the insulation thickness or 300mm whichever is greater. Insulation system same as the main piping shall be applied to the extensions.

b) Valves and fittings shall be insulated with appropriate insulation compatible and equivalent to the insulation as that of adjoining piping.

c) All flanged joints shall be insulated with removable box insulation compatible and equivalent to the insulation as that of adjoining piping.

d) Items like bonnet of valves above the packing glands, display like nameplates, stampings, inspection code etc. shall be specially designed and insulated so that the display is not covered by insulation.

3.3. Painting under insulation

Pipeline shall be protected from corrosion by providing appropriate painting under insulation as per EIL specification for painting B957-000-06-42-PLS-01 attached elsewhere in the tender.

4.0 MATERIALS & ACCESSORIES

All materials used for insulation shall be freshly procured. Material shall be supplied, dry, shall be non-sulfurous, rot proof, vermin proof, non-injurious to health and non-corrosive to steel, shall not disintegrate, settle, change its form of composition, in a detrimental way during service. Typical details/ minimum technical requirement of the major insulation materials and accessories are given in this specification.

4.1. Rock wool

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Rock wool is a fibrous insulation made from molten rock, bonded with resin or suitable binder. The term rock wool shall mean fibrous insulation wool made from natural rock and does not refer to products manufactured from slag or glass. For application over austenitic stainless steel, the material shall be zinc free and shall be inhibited with sodium silicate as per ASTM C-795.

4.1.1 The material may be used up to 550^0C, but shall meet the general classification of respective standards and service temperature requirements as mentioned below:

Form of Fibrous Material	Quality standard	Max service temperature
Preformed pipe sections	ASTM C547 / IS 9842	760^0C
Insulation blanket with wire net facing	ASTM C592 / IS 8183	649^0C
Resin bonded mattress (max 2% resin)	ASTM C612/ IS 8183	760^0C

Rock wool shall meet following minimum properties:

Characteristics		Material type	
		Pipe sections	Blanket
Service temperature (°C)		650	650
Nominal Density (kg/m^3), in acc. with ASTM C302 (pipe)/ ASTM C303 (Slab)/ASTM C167 (blankets)/IS 8183/		140	128
Linear Shrinkage (%) at 550°C/ 24 hours as per ASTM- C-356, max.		2	2
Non fibrous shot (%) as per ASTM C-1335 / 3144, max		15	15
Water vapor sorption (%) as per ASTM C1104, max.		5	5
Compressive strength at 10% deformation (kPa) as per ASTM C165, min.		-	-
Alkalinity, pH as per ASTM C-871		7-10	7-10
Leachable Chloride as per ASTM C-871, ppm, max.		10 (Note-1,2)	10 (Note-1,2)
Test for incombustibility OR fire resistivity	Incombustibility as per 8183/IS 3144	Pass	Pass
	OR Flame spread as per ASTM E84	25	25
Thermal Conductivity (W/mK), IS 3346 /ASTM C177/ASTM C-518 at mean temperature, max.	(+) 100°C	0.052	0.052
	(+) 200°C	0.070	0.068
	(+) 250°C	0.085	0.080
	(+) 300°C	0.10	0.090
Note-1: Max. 20 ppm allowed for application over carbon steel and low alloy steel *Note-2: The type test certificate shall not be older than 2 years*			

4.2. Aerogel

Flexible aerogel insulation is a composite of an amorphous silica-based aerogel, a fibrous carrying media, or reinforcements, or a combination thereof, that allow the construct to be

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flexible. The material shall be in accordance with ASTM C1728 Type-III, Gr.1A. The material shall have following general properties:

Characteristics		Value	Remarks
Temperature range (°C)		24 to 649	
Density (kg/m^3) ASTM C303, min		160	Note-1
Compressive Strength (kPa), min, at 10% deformation (ASTM C165)		20.7	
Linear shrinkage at maximum exposure temperature for 24h , max, % (ASTM C356) in length & width		2	
Water absorption, max, % by weight		8	
Water vapour sorption, by weight, max %, (ASTM C1104/C1104M)		5	
Flame spread index (ASTM E84), max Smoke developed index (ASTM E84), max		5 10	Note-2
Thermal conductivity (W/mK) at mean temperature (°C) (ASTM C177)	(+) 24 °C, max	0.021	
	(+) 149 °C, max	0.025	
	(+) 204 °C, max	0.029	
	(+) 260 °C, max	0.032	
	(+) 371 °C, max	0.043	
Note-1: Batch test - Supplier shall provide test certificate for each production Batch *Note-2: Type test - Supplier shall provide Type test certificate no older than 2 years*			

4.3. Calcium Silicate

Calcium silicate pipe sections shall be supplied in the form of either in the form of molded pipe sections or block cut into required shape/ pipe sections using a CNC machine, shall conform to general classification of IS 9428 (950 grade) or ASTM equivalent C533 TYPE II, shall be suitable for continuous service up to 927°C. Material shall conform to the general classifications of respective ASTM / IS code and meet the following minimum properties

Properties		Values	Remarks
Density (kg/m^3) as per ASTM C302/303 / IS 5688		240-350	Batch test *(Note-1)*
Linear shrinkage at 927^{0}C for 24hrs, (%) max, IS 5688 / ASTM C-356		2	
Moisture content, weight %, max., ASTM C1616		20	
Water absorption, volume (%) as per ASTM C533, max.		3	
Compressive strength (of dry sample) at 5% deformation, kPa,min	ASTM C165 OR	688	
	IS 5688	415	
Heat resistance after exposure to 927^{0}C for 24hrs, as per IS 5688	(%) loss in weight, max	15	
	Compressive strength at 10% deformation, kPa, min	345	
Flexural strength min. (kPa) as per ASTM C203/C446		344	
Mass loss by tumbling, max, % after first 10 minutes, ASTM C421		20	
Leachable Chloride as per ASTM C871, ppm, max		50	
Alkalinity, pH as per ASTM C-871		6-10.5	
Thermal conductivity (W/mK) max. at mean temperature as per IS 9490 / ASTM C-177 (Note-1,2)	(+) 204 ^{0}C	0.088	Type test *(Note-2)*
	(+) 316 ^{0}C	0.097	
	(+) 427 ^{0}C	0.105	
	(+) 538 ^{0}C	0.111	

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Note-1: The type test certificate shall not be older than 2 years
Note-2: For thermal conductivity determination for pipe / curved segment, a representative flat slab may be used for performing the tests.

4.4. Preformed Polyisocyanurate Rigid Foam (PIR)

PIR rigid foam shall be performed into free rise buns made from HCFC free chemicals and then cut into required shape/ pipe sections using a CNC machine. Material shall be chemically inert, moisture free, rot and vermin proof not disintegrate, settle, change its form or composition in a detrimental way while in service. PIR rigid foam shall conform to general classification of ASTM C591 Grade-2 Type-II and meet the following specification:

Characteristics		Value	Remarks
Bulk density (kg/m^3), ASTM-C302/ ASTM -D1622		40	Batch test *(Note-1)*
Closed Cell content (%), ASTM D-6226 Procedure-2,min		95	
Chloride content (ppm) ASTM C 871, Procedure 2, max		60	
pH (ASTM C 871)		6-7	
Water vapour transmission (ng/Pa-s-m), ASTM E-96 method-A at 23°C & 50% RH, max.		5.1	
Compressive strength at 10% deformation (kPa), ASTM D 1621, min.		240	
Flame spread Index (ASTM E84), max.		25	Type test *(Note-2)*
Thermal conductivity of 180 days aged sample at mean temp (W/mK) ASTM C-177, max.	(+)10 deg C	0.026	
	(-) 20 deg C	0.027	

Note-1: Supplier shall provide test certificate for each production batch
Note-2: The type test certificate shall not be older than 2 years

4.5. In situ PUR

The PUR insulation shall be closed cell, low density (installed density min 60 kg/m3), two component polyurethane rigid foam system (slow rise expansion), consisting of one component MDI (Di-phenyl methane-4,4'di-isocyanate) and one component of a polyol blend for polyurethane (PUR) rigid spray/pour-foam for injection and in situ foaming and manufactured without the use of blowing agents that contain CFC's or HCFC's. Material shall be chemically inert, moisture free, rot and vermin proof not disintegrate, settle, change its form or composition in a detrimental way while in service. Material used in similar cryogenic service shall only be considered. The Polyurethane foam in general shall meet the following requirements:

Characteristics		Value	Remarks
Bulk density (kg/m^3), ASTM -D1622 min.		60	Batch test *(Note-1)*
Closed Cell content (%), ASTM D-6226 Procedure-2, max		95	
Chloride content (ppm) ASTM C 871, Procedure 2, max		60	
pH (ASTM C 871)		5.5-7	
Water vapour transmission (ng/Pa-s-m), ASTM E-96 method-A at 23°C & 50% RH, max.		5.5	
Water absorption (%), ASTM D2842, max.		2	
Compressive strength at 10% deformation (kPa) at 23°C, ASTM D 1621, min.		200	
Tensile strength (kPa) at 23°C, ASTM D 1623, min.		320	
Flame spread Index (ASTM E84), max.		25	Type test *(Note-2)*
Thermal conductivity of 180 days aged sample at mean temp (W/mK) ASTM	(+)24 deg C	0.030	
	(+)10 deg C	0.029	

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Characteristics		Value	Remarks
C-177, max.	(-) 46 deg C	0.029	

Note-1: Supplier shall provide test certificate for each production batch
Note-2: Type test certificate no older than 2 years

4.6. Multiplex Foil

Multiplex laminated foil (~50-micron thickness) consisting of one aluminium foil (25µ) sandwiched between two 12µ polyester films). Materials shall have following characteristics:

Characteristics	Values
Service temperature range (°C)	-60 to 120
Volumetric mass (kg/dm^3)	1.93
Tensile Strength, MPa	100
Yield Strength, N/cm	70
Tear resistance, g/mm	400
Water Vapour Permeability, ASTM E96 Procedure E (Metric perms)	0.0007

4.7. Sealing tape for multiplex foil

Sealing tape shall be a three-layer laminated foil (~50-micron thickness) made of aluminium & polyester (25µ aluminum foil sandwiched between two 12µ polyester films. Material shall have following properties.

Characteristics	Values
Total thickness exclusive of adhesive layer	50 µm
Temperature range	+120°C to -45°C
Volumetric mass	1.93 kg / dm³
Water vapour permeability in acc. with ASTM E 96, procedure E (37.8°C, 90% R.H.)	Max. 10.10-6 g / (m².h.mmHg)

4.8. Polymeric membrane barrier

The polymeric membrane is a self-adhesive heavy-duty laminate and is comprised of elastomeric modified butyl rubber (1.2mm) with PET (12µm) /AL (25µm) /PET (12µm) foil backing. The membrane shall be able to produce a vapor tight, weather resistant cover over the insulation. The material shall be supplied in the form of rolls with thickness 1.2-1.3mm. The material shall meet the following properties as minimum.

Characteristics		Values
Service temperature range (°C)		-60 to 120
Tensile strength (N/cm), Min., ASTM D1000		55
Elongation at break (%), ASTM D412		40
Puncture resistance (N), Min. ASTM E154		350
Peeling Strength, N/cm, min, ASTM D903		20
Surface Burning Characteristic, ASTM E84	Flame Spread Index	15
	Smoke Developed	25
Water Vapour Permeability, ASTM E96 Procedure E (Metric perms)		0.00

4.9. Joints Sealant for PIR Insulation

The joint sealant for joints between insulation blocks shall be compatible with the base insulation material and suitable for the temperature range to which it is exposed. Typical material and technical requirement for PIR insulation system is specified below. Proposed materials shall be technically equivalent and shall have proven reference for use in a temperature range and shall meet the minimum technical requirement given below

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General Characteristics	Combustibility/ fire resistance	Water vapour permeance (max)
Average 82% volume solid as per ASTM D2369	Flame spread and fuel contribution negligible when used as 3.2 mm wide sealant between joints of incombustible insulation blocks	Negligible when measured across 3.2 mm wide sealant between joints of impermeable insulation blocks

4.10. Adhesive for Calcium silicate Insulation

Sodium silicate-based adhesive is a high-temperature resistance adhesive forms bonds by evaporation of water, which is used to bond calcium silicate. The total soluble silicate (% wt.) in adhesive shall be minimum 38 and matter insoluble in water shall be maximum 0.2 wt%. The sodium silicate-based adhesive in a dry state is soluble in water and therefore should be suitably protected if used in an application where moisture can be encountered.

Characteristics		Values
Service temperature range (°C)		10 to 538
Density (kg/l), ASTM D1475		1.44-1.68
Non-volatile content (wt. %), ASTM D1644		54-70
Volatile organic content (VOC), (g/l) ASTM D3960		0
Hardness (Shore-C), Min. ASTM D2240		65
Resistance to Cracking, ASTM C474		No cracking
Leachable chloride (ppm), ASTM C871		<60
pH, ASTM C871		11-12
Surface Burning Characteristic, ASTM E84	Flame Spread Index	0
	Smoke Developed	0

4.11. Joint sealant for joints of metal cladding

The technical requirement and typical material for joint sealant of metal cladding is specified below. Proposed materials shall be technically equivalent and shall have proven reference for use in a temperature range and shall meet the minimum technical requirement given below

General Characteristics	Combustibility/ fire resistance	Water vapour permeance (max)
Average 52% volume solid as per ASTM C461	FSI (flame spread index) $\leq$ 20 as per ASTM E-84, tested on a 6.3mm inorganic reinforced cement board with DFT ~2mm	0.0092 metric perms (as per ASTM F-1249 with DFT 2.8mm)

4.12. Outer Cladding

a) Unless otherwise mentioned, aluminium jacketing shall be used as weather protection cladding up to temperature 550 deg C. Aluminium cladding shall be as per ASTM C1729, Class-A having polysurlyn lamination on inside surface and shall meet the requirements of ASTM B209 alloy 3003 H14.

b) For temperature above 550 deg C and/ or for fire safe insulation (for all temperature range) cladding shall be stainless steel or aluminized steel as per ASTM A167 / A240 type 304 or aluminized steel as per ASTM A463, type 2, coating designation T2-100, with polysurlyn lamination on inside surface. Equivalent IS code shall be acceptable for the metal sheet.

Cladding metal sheets shall have minimum thickness as below:

Item	Insulation O.D (mm)	Thickness (SWG)

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Pipe	< 500	26
Pipe	> 500	24
Valves, flanges and foot traffic areas	-	22

Note : Cladding thickness indicated above is excluding polysurlyn lamination thickness.

4.13. Banding

Band to secure last layer of PIR insulation materials shall be stainless steel to ASTM A-167 304. For aluminium cladding, aluminium band (Aluminium 99.5, temper H14) in accordance with ASTM B-209M shall be used. The band shall be 20 mm width x 24 SWG.

5.0 APPLICATION

5.1 General

The insulation system needs to be installed in dry condition. The contractor shall be responsible for developing a detailed application procedure specific to the lining system and materials concerning for different area. Minimum technical requirements specific to some typical applications are given in this specification as a guideline and information. The detail insulation application procedure shall be approved by EIL/BPCL prior to startup of work.

5.2 Surface preparation and painting under insulation

Surface of the piping shall have suitable painting for prevention of corrosion under insulation. Quality of paint, necessary surface preparation, coating application and thickness shall be as per painting specification appended elsewhere in the tender.

5.3 Storage

a) Materials shall be stored in appropriate manner meeting specific handling and storage conditions as per respective manufacturer's recommendation.
b) Insulation materials must be stored under covered shed and protected against any damage, from delivery to finish cladding.
c) Insulation material slabs and sections shall be stored on a flat surface in a horizontal position. Insulation material shall never be stacked directly on the ground.
d) Insulation materials for SS piping shall be identified and stored properly. Sample test of these insulation materials shall be carried out at NABL laboratory by contractor. Sample selection to be carried out at site by EIL/BPCL at site.

5.4 Application of insulation blocks

a) PIR and calcium silicate shall be installed from prefabricated pipe sections only.
b) Calcium silicate pipe sections shall be installed to the pipe dry. Longitudinal and circumferential joints shall be glued with calcium silicate-based adhesive.
c) Subsequent layers of calcium silicate shall be placed one above another with adhesive/adhesive tape as appropriate. All longitudinal and circumferential joints are glued to adjoining sections.
d) Apply multiplex foil over the after 2nd layer and final layer of calcium silicate insulation. The foil shall be cut to size correctly and shall be installed with dots of adhesive at the surface, tightly stretched and without air inclusions. The joint shall be sealed with multiplex tape of aluminum/polyester.
e) Outer layer PIR (75mm) fabricated into pipe sections shall be installed dry over Calcium Silicate. Both longitudinal and circumferential joints shall be staggered, glued with PIR sealant.
f) PIR insulation shall be secured with SS band (SS304)
g) Apply polymeric membrane over the PIR insulation with min. 50mm overlap followed by metal cladding.

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h) Insulation shall terminate near flanges at a gap to allow opening/ closing of bolts. For fittings, the insulation shall be completed by applying cut segments of the same insulation sections used for pipes.

i) Removable covers shall be provided over all flanges and valves. Loose fill mineral wool backed up by slab insulation of thickness equal to that an adjacent pipe shall be applied. Stainless steel covers over the valves and flanges shall be fitted with quick release clips.

5.5 Application of in-situ PUR/PUF

The PUR (polyurethane foam) over the pipe may be applied by spray method OR by injection. Insulation process (irrespective of spray applied or injection method) must allow visual inspection of the PUR surface for the entire length of the pipe before it goes for cladding. The insulation thickness for bends shall be same as main pipe. No negative tolerance (-0/+3mm) permitted for the PUR insulation thickness of pipe and bends. Cutback at the pipe ends and bend ends for PUR insulation shall be minimum 150mm for both sides. Insulated pipe spools after PUR application, shall be 100% visually inspected for voids, blow holes etc. Physical defects / voids, if any found in PUR, shall be rejected or repaired before cladding.

5.6 Application of Aluminium cladding

a) Al cladding with one side poly-surlyn laminate shall be supplied in sheets. The sheets shall be rolled to outer diameter keeping the poly-surlyn laminated face inside.

b) The rolled sheets shall be wrapped over the outermost insulation layer after the application of polymeric membrane. The cladding shall have overlapped at least 50mm in both longitudinal and circumferential directions. Cladding shall be secured in position by means of Al- band at interval of 400mm.

c) All longitudinal and circumferential joints of metal sheeting shall be sealed with suitable approved non-hardening elastomeric mastic sealer.

d) The cladding shall be installed such that entrapped moisture, if any at the time of installation can be drained. At horizontal piping, in the middle between two supports, at the lowest point, drain holes shall be provided, min.1 hole / 6 m, dia. 10 mm.

5.7 Protection of partially completed job

Each day's work shall be planned properly so finish with insulation and cladding. Ongoing jobs shall be protected from rain water by tarpaulins cover.

6.0 HSE REQUIREMENT

The contractor responsible for the refractory installation shall be fully conversant and meet the HSE requirements of BPCL.The contractor shall strictly adhere to safety instructions and MSDS requirements of the insulation material/ ancillary products and application. The contractor shall provide adequate personnel protection and safety gears like hand gloves, masks, spectacles etc. as necessary for compliance to MSDS safety requirements to the workmen on the job.

7.0 DOCUMENTS REQUIRED FROM CONTRACTOR

POST ORDER STAGE THE CONTRACTOR SHALL SUBMIT

a) Manufacturer's datasheet for the insulation and ancillaries materials.

b) Manufacturer's compliance datasheet for insulation and ancillaries material.

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c) Quality control plan for insulation material supply and application

d) Inspection Test plan for insulation material supply and application

e) Test certificate of insulation & ancillary materials duly endorsed by inspection agency

f) Insulation details drawing

g) Method statement for insulation application procedure including HSE requirement.

h) Proven references for supply of insulation material used under similar condition

i) Credential of insulation designer/applicator agencies

j) List of engineers/ supervisors along with their qualification and experiences of personnel to be deputed by the insulation applicator for insulation installation on demand.

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Scope of Work and Job Specifications for BPREP Package Contracts (Digital Technology Solutions)

PROJECT : **BINA PETCHEM & REFINERY EXPANTION PROJECT, (BPREP)**

OWNER : **BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**

PMC / EPCM : **ENGINEERS INDIA LIMITED (EIL)**

JOB NO. : **B957/ B925/ B933**

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	11.01.2025	REVISED AND ISSUED FOR TENDERING	AKP	DP	SB
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1.0 GENERAL

1.1 The Specification given below provides Scope of Work and Job Specifications for Digital Technology Solutions. The same shall be read in conjunction with the Licensor's process package, Scope of Work and Job Specifications for other functions and depts. provided elsewhere in the tender document. Bidder shall provision, implement, support, utilize the digital solutions (as applicable) as per requirements of process package, engineering design basis, standards, specifications and drawings enclosed with this bid package.

1.2 **Location of field equipment & accessories:** The field equipment and accessories for digital solutions covered in this document shall be deployed during construction phase. The same shall be uninstalled and removed before feed cut-in i.e. from the hazardous area. In existing refinery areas, where work is to be conducted in hazardous area, IS Mobile Phones and Active RFID/BLE devices shall be suitable for respective hazardous area.

Bidder shall ensure that Bidders and their subcontractor's personnel having ordinary (Safe Area use) mobile devices and/or Active RFID/BLE Cards do not enter the units of existing BPCL Plants, as those are electrically hazardous areas.

2.0 SCOPE OF WORK/SUPPLY

S. No.	DESCRIPTION	Scope of Supply/Work	
		Bidder	Purchaser
2.1	**Scope of Supply/Work:** For Digital Solutions in Bidders Scope- Design, Engineering including residual engineering, detail engineering, procurement, supply, implementation and operations including all hardware and software of all systems preparation of engineering drawings and documents, review of vendor drawings, manpower support, coordination with Clients other Contractors/Vendors etc. Scope of Work also includes providing support and utilizing (Note-1) Digital Solutions deployed by Client or their contractors/vendors. All the digital solutions shall be operational only for the project duration and shall be decommissioned and removed at the end of the construction/during commissioning period, or as instructed by Engineer-In charge.		
2.1.1	Control Tower/ Common Data Environment (CT/CDE) – Provisioning and Implementation.		Yes
2.1.2	Control Tower/ Common Data Environment (CT/CDE) – Support.	Yes	
2.1.3	Project Management Information System (PMIS) – Provisioning and Implementation.		Yes

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2.1.4	Project Management Information System (PMIS) – Support.	Yes	
2.1.5	4D Monitoring Solution – Provisioning and Implementation.		Yes
2.1.6	4D Monitoring Solution – Support (Note 2)	Yes	
2.1.7	Digital Quality Inspection System (DQIS) – Provisioning and Implementation.		Yes
2.1.8	Digital Quality Inspection System (DQIS) – Support.	Yes	
2.1.9	Camera based- Digital Safety Management System (DSMS-CAMERA) – Provisioning and Implementation.		Yes
2.1.10	Camera based- Digital Safety Management System (DSMS-CAMERA) – Support.	Yes	
2.1.11	App Based Digital Safety Management System (DSMS-APP) – Provisioning and Implementation.		Yes
2.1.12	App Based Digital Safety Management System (DSMS-APP) – Support.	Yes	
2.1.13	Automated Manpower Productivity System (MANPS) – Provisioning and Implementation		Yes
2.1.14	Automated Manpower Productivity System (MANPS) – Support.	Yes	
2.1.15	Warehouse management system (WMS) – Provisioning and Implementation. (Note-3)	Yes	
2.1.16	Warehouse management system (WMS) - Integration with Purchaser's CT/CDE.		Yes
2.1.17	Transport Management System (TMS) – Provisioning and Implementation.	Yes	
2.1.18	Transport Management System (TMS) - Integration with Purchaser's CT/CDE.		Yes
2.1.19	Spool Management System – Provisioning and Implementation *(Where Spool Fabrication at site is in Bidder's Scope)*	Yes	
2.1.20	Welding Management System- Provisioning and Implementation. *(Where Piping Welding Works at site are in Bidder's Scope)*	Yes	
2.1.21	Cabling Management System- Provisioning and Implementation *(Where Cabling Works at site are in Bidder's Scope)*	Yes	

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2.1.22	Providing Mobile Devices (Tablets /Smart Phones) to Bidders concerned personnel, for use of DQIS, DSMS-APP, CT/CDE and other digital solutions.	Yes	
2.2	Coordination		
2.2.1	Coordination with • Purchaser • Owner Management Consultant (OMC) • MPMC (Managing PMC) • PMC/EPCM • Purchaser's Master System Integrator (MSI) for CT/CDE, PMIS, 4D Monitoring, DQIS, DSMS-Camera, DSMS-APP and MANPS. • Purchaser's Hardware Service Provider (HSP) for DSMS-CAMERA and MANPS. • Sub-vendors of Digital Solutions Implemented by Bidder.	Yes	
2.3	Training		
2.3.1	Training for Spool Management System, Welding Management System and Cable Management System for purchaser's personnel, bidder's own personnel and sub-contractor's personnel.	Yes	
2.4	Operations, Support and Maintenance		
2.4.1	Operations Support and Maintenance Services for Spool Management System, Welding Management System and Cable Management System.	Yes	
2.5	Cyber Security Requirements		
2.5.1	Cybersecurity Compliance as per BPCL's Cybersecurity guidelines for Spool Management System, Welding Management System and Cable Management System.	Yes	
2.6	Watch and Ward/Safekeeping of Digital Technology Solutions Devices	Yes	
2.6.1	Responsibility for safekeeping of Digital Technology Solutions devices deployed by Purchaser viz. DSMS-CAMERA - Camera, routers, Network/ Edge devices, Server, NVR, workstation PCs etc. and MANPS-RFID/BLE Cards, Readers, Network/ Edge devices inside Bidders B/L or Work Area.	Yes	

Notes:

1. **Support-** Support consists of aid in implementation of the digital solution on ground:
    a. Providing information for the checklists/ KPI's

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b. Providing Data for self/ sub-contractors in a timely manner

c. Distributing/ setting up of active RFID/BLE Tags/ sensors from the purchaser's implementation partner.

d. Providing Power Supply/ Installation Supports, as applicable, for respective digital solutions.

e. Use the functionality of the digital solution/ tools for the intended purpose.

f. Coordination with purchaser's digital implementation partners

2. Where 3D Modelling is in bidder's scope.
3. Where Warehouse is in bidder's scope.
4. In case of non-functionality of any of the digital solution planned by Purchaser, bidder shall report for each use case in other forms as instructed by Engineer-in-Charge
5. Bidder shall ensure that smartphones deployed are not misused for taking unauthorized photos and videos. Person found doing so may be handed over to the security team for further action.
6. One or more solution may not be applicable based on nature of job / tender conditions / scope of work.
7. OMC/MPMC/PMC/EPCM are having responsibility of project progress monitoring. These consultants will be actively engaged with the bidder for successful utilisation of the digital solutions
8. In case devices deployed by Purchaser as per point 2.6.1 are damaged by contractor, recovery shall be made from their running bills for actual cost incurred by BPCL plus admin charges in line with GCC.

3.0 JOB SPECIFICATIONS

3.1 CONTROL TOWER/ COMMON DATA ENVIRONMENT & PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)

3.1.1 System Overview

3.1.1.1 Purchaser intends to deploy a Control Tower/CDE and PMIS System for Project Planning, Scheduling and Monitoring, Project Cost Control, Workflows between Client, MPMC, PMCs, EPCs and EPCMs Contractors; Report Generation and 4D Project Monitoring, etc. The entire reporting including Planning Package, Project Schedules, DPR, WPR, MPR etc is expected to be executed online through the above systems.

3.1.1.2 The systems deployed by Purchaser shall be broadly in alignment with the relevant specs for Project Planning, Scheduling, Monitoring And Control System for this Contract (Encl. elsewhere in the tender) and bidder's obligations shall be read in context and in alignment with the same.

3.1.2 Bidders Obligations

3.1.2.1 Bidder shall support implementation of CT-CDE and PMIS (deployed by the Purchaser) by providing data/ update for the KPIs for self and sub-contractors through APIs/ Excel templates/ Manual Data Entry etc. in the PMIS System. Data shall be provided by bidder through excel templates or manual entry or online forms etc which will be specified and provided by purchaser.

3.1.2.2 Bidder shall be provided 1-2 No. User Id's to access the PMIS System for providing input.

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3.1.2.3 As a minimum bidder shall provide data for KPIs in CT-CDE as per Annexure-1-KPI List.

3.1.2.4 Bidder shall be responsible for complying with the workflows as defined in the PMIS.

3.1.2.5 Bidder shall nominate representatives to attend mandatory PMIS training sessions and achieve proficiency in use of the same.

3.1.2.6 Bidder shall provide URL's for Viewing Physical Location on Critical Equipment, Long Lead Items (LLI's) interfaced from Transport Management Solutions of Vendors/Contractors.

3.1.2.7 Bidder shall be required to prepare schedule either in primavera or MSP and submit the same through PMIS System MPMC/PMC for approval and subsequent monitoring. Bidder will also have to carry out schedule updation on regular basis. Scheduling platform, frequency of schedule updation (daily/ weekly/ fortnightly / monthly), mechanism of schedule updation either in primavera/MSP or PMIS platform or primavera/MSP export excel file upload etc, schedule weightages, schedule formats etc will be informed to successful bidder. Bidder may also have to revise schedule to take care of emergent activities or crashing / fast tracking of schedule to overcome delays. Bidder will have to comply these requirements or any other requirement for success of scheduling tools deployed by Purchaser.

3.1.2.8 Reporting of Daily Progress, Weekly Progress, Monthly Progress covering Executive Summary, Areas of concern, problems and hold ups, resource deployment, project risks etc will be carried out through excel or manual entry or templates or online forms etc which will be provided by purchaser.

3.1.2.9 PMIS shall have provision of maintaining DCI, procurement status, manufacturing status, site construction works status. Bidder to provide needful information for these index/status/report. Format for input shall be informed to successful bidder.

3.1.2.10 Bidder shall provide relevant information for project cost status such as cost commitment, cost expenditure, expected cash flow etc in the prescribed formats specified by Purchaser.

3.1.2.11 Bidder to also refer and comply to "PROCEDURE FOR SMART INTEGRATED ENGG., DIGITAL HANDOVER OF DRAWING/DOCUMENT/ 3D MODEL AND DIGITAL INTERVENTION BY BIDDER".

3.1.2.12 The Bidder is responsible for ensuring data integrity and timely submission. Failure to provide data/ info on timely basis may be considered a breach of contract.

3.2 4D MONITORING

3.2.1 4D Monitoring Platform will be provisioned and implemented by purchaser. The solution will integrate the schedule and actual progress data and 3D Models for rendering the 4D model. It will implement visualization of work at different stages of Procurement and Construction w.r.t. the schedule. The 4D rendering will highlight items, color code items and work done during any specified period.

3.2.2 Wherever 3D Modelling is in Bidder's scope, bidder shall support and utilize 4D Monitoring Platform deployed by Purchaser by using Navisworks (.nwd) files from 3D models and Schedule and Actual progress data from PMIS/ P6 EPPM or MS Projects for the unit.

3.2.3 Bidder has to prepare schedule in such a manner that activities/ tasks can be mapped to 3D model elements.

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3.2.4 4D Monitoring will be progressively detailed from L1 to approx. L4 Level (Work Package) as 3D Model Matures and the project moves from Engineering to Commissioning Phase. Update Frequency will be Monthly. Bidder shall provide inputs accordingly.

3.3 DIGITAL QUALITY INSPECTION SYSTEM (DQIS).

3.3.1 System Overview

3.3.1.1 Purchaser intends to deploy a Digital Quality Inspection System for quality inspection for status monitoring, recording and storing digital copy of quality inspection records for inspections at Vendor Shops and Fabrication Yards and Construction site .All quality inspection process is expected to be conducted through DQIS. DQIS shall have provision for stagewise inspection activities for Shop Inspection ,Civil, Structural, Piping, Mechanical, Equipment Erection, Electrical, Instrumentation, Pre-commissioning and commissioning works and shall align with the job specifications and ITPs for respective activities provided elsewhere in the tender documents. Project Progress reports (PMIS) shall also be linked to DQIS.

3.3.1.2 DQIS shall have inbuilt user help features, offline working capabilities on the mobile devices/ smart phones and Dashboards for status monitoring.

3.3.1.3 DQIS shall maintain detailed immutable audit trails for each inspection, ensuring transparency and traceability. This helps in tracking any changes made during the inspection process.

3.3.1.4 DQIS shall be accessed through browser-based interface on laptops, tablets and mobiles. A Mobile App shall also be provided for user access from smart phones (Android™ 11 or later versions and IOS).

3.3.2 Bidders Obligations:

3.3.2.1 Bidder shall be responsible for capturing/entering data, observations, and deviations, annotations, submitting resolutions (as applicable) ,providing info to prepopulate dropdown lists for the forms defined in DQIS and in line with bidders' scope and ITP's and obtaining the approval on DQIS report from relevant inspector. In-built cameras of tablets and smart phones will be utilized for capturing images during inspection. The images can be of the detail inspection reports, backup documents and photograph(s), if any, taken by inspector during inspection..

3.3.2.2 Bidder shall comply with the workflows defined in the DQIS broadly covering the shop inspection and entire site inspection process including raising inspection calls, conducting inspection, raising queries/ observations/ problems/ comments, submitting resolution to PMC/ MPMC/ Client observations/ comments/ issues etc.

3.3.2.3 Bidder and its supervisory personnel shall actively monitor dashboards and reports generated by DQIS to track unresolved issues and compliance trends, ensuring timely compliance.

3.3.2.4 Bidder shall coordinate with all stakeholders as necessary for timely and effective execution of inspections of the project through DQIS.

3.3.2.5 Bidder shall nominate representatives to attend mandatory DQIS training sessions and achieve system proficiency within one month of deployment.

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3.3.2.6 Bidder shall comply with the DQIS data security protocols and ensure that only authorized personnel access the system using approved devices.

3.3.2.7 Bidder shall ensure their personnel including sub-contractors and vendors are equipped with laptops/ tablets/ smartphones (AndroidTM 11 or later) for use of the DQIS System. User/ Role based access to the system shall be provided. For Refinery revamps contracts, intrinsically safe smartphones are to be deployed.

3.3.2.8 Bidder shall follow the manual paper/ email-based Quality Templates as defined in the relevant specs and directions of Engineer-in-Charge in case the DQIS is dysfunctional or is withdrawn during the course of execution of the contract.

3.4 CAMERA BASED DIGITAL SAFETY MANAGEMENT SYSTEM (DSMS-CAMERA)

3.4.1 Solution Overview

3.4.1.1 Purchaser intends to deploy a Camera based Digital Safety Management System with AI video analytics for the BPREP Project. DSMS Camera shall have feature to detect and report different types of safety violations/ incidents by AI based video analytics in real-time like PPE (Helmet, Safety Jacket, Safety Shoe) non-compliance detection, Intrusion in restricted zones detection, Absence of barricades/ safety railing, Unsafe working at height etc. The system shall also have workflows for reporting and resolving the detected safety violations.

3.4.1.2 Purchasers other Vendors shall be deploying multiple devices like wireless cameras, routers, field network, network switches, cables, network devices, servers/ edge devices, Network Video Recorder etc throughout the project area. A number of devices shall be deployed in the Bidders work areas including laydown and fabrication yards.

3.4.2 Bidders Obligations

3.4.2.1 BIDDER shall coordinate with all stakeholders (MPMC, PMC, Purchasers Other Vendor) to facilitate timely and seamless installation, operation, maintenance and decommissioning of the entire DSMS-CAMERA Solution within Bidders work area including relocation of devices as per project progress during execution of the project.

3.4.2.2 Bidder shall coordinate their site works with purchaser's DSMS Camera Solution Provider. Bidder shall support DSMS camera solution provider to facilitate hindrance free camera view

3.4.2.3 The System will have feature to automatically report the safety violations observed to the bidder/ bidder's vendor/ sub-contractor HSE personnel with observation (text and photo/ video and other details. Bidder shall address and resolve reported violations within 48 hours by submitting detailed proof of resolution through the DSMS-CAMERA. This may include textual descriptions of corrective actions, updated photographs, demonstrating rectification measures, and additional comments if required. Rejected resolutions shall be readdressed promptly as per feedback provided within the system.

3.4.2.4 Bidder shall depute safety officers to identify the contractor against each violation where multiple contractors are deployed in a working area.

3.4.2.5 Purchaser's vendor will also deploy TV screens for monitoring of safety using live view cameras, safety videos. If instructed by the Engineer-In-Charge bidder shall deploy

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dedicated safety officer for monitoring of the cameras, observe any violation and inform other safety officers deployed at site to immediately take corrective action.

3.4.2.6 Bidder shall actively monitor DSMS-Camera dashboards and reports generated by DSMS-CAMERA to track unresolved issues and compliance trends, ensuring timely compliance.

3.4.2.7 Bidder shall comply with the DSMS-CAMERA data security protocols and ensure that only authorized personnel access the system using approved devices.

3.4.2.8 Bidder shall nominate representatives to attend mandatory DSMS-CAMERA training sessions and achieve system proficiency within one month of deployment.

3.4.2.9 Bidder shall be responsible for safekeeping of DSMS-CAMERA devices and TV screens deployed by Purchaser's Vendors in the Bidders Unit/ Work area.

3.5 APP BASED DIGITAL SAFETY MANAGEMENT SYSTEM (DSMS-APP)

3.5.1 Solution Overview

3.5.1.1 A web application and Mobile App based Digital Safety Management System (DSMS-APP) hosted in Meity empanelled cloud data centre, will be provisioned and implemented by purchaser. The application will have feature to report different types of safety violations, incidents e.g. PPE non-compliance, unsafe working at height, absence of fence/ barricade in required areas, intrusion in restricted zones, proximity to heavy/ dangerous machinery, fire/smoke etc. in real-time from Smart phones (Android™). Safety violation reporting will include capture of violations/ non-compliance observed by BPCL, EIL, Bidder with photo(s), short (upto ten second) video from the field.

3.5.1.2 The application will have feature to report the safety violation observed to the bidder/ bidder's vendor/ sub-contractor HSE personnel with observation (text and photo/ video) along with corresponding contract name, type and category of violation, date, time etc. It shall also have feature for concerned contractor's/ sub-contractor's HSE personnel to submit resolution against the violation with Text plus Photo(s), short (upto ten second) video. The application will have feature to accept/ reject & return Contractor's/ sub-contractor's Resolution against the violation.

3.5.2 Bidders Obligations

3.5.2.1 Bidder shall support implementing DSMS-APP by providing consent by their employees and vendors'/ sub-contractors' employees and utilizing the application. Bidder shall ensure that each and every safety violation/ incident observed and reported through the DSMS-APP in their work unit are looked into, corrective actions are taken and resolution is submitted.

3.5.2.2 Bidder shall ensure all their own and vendors/ sub-contractors designated HSE personnel at field are equipped with smartphones (Android™ 11 or later) to use the DSMS-APP.

3.5.2.3 Bidder shall nominate representatives to attend mandatory DSMS-APP training sessions and achieve system proficiency within one month of deployment.

3.5.2.4 Bidder shall facilitate full compliance with the use of DSMS-APP for safety violation reporting, good observations reporting, resolution tracking, and emergency notifications.

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3.5.2.5 Bidder shall follow the manual paper/ email based HSE compliance system as defined in the HSE Specs and directions of Engineer-in-Charge in case the DSMS-APP is dysfunctional or is withdrawn during the course of execution of the contract.

3.5.2.6 Bidder shall ensure that all safety violations, incidents, and near-miss events observed on-site are reported through the DSMS-APP timely. Each report shall include accurate details, relevant photos, short videos (10 seconds max), and annotations to highlight the specific safety issue.

3.5.2.7 Bidder shall address and resolve reported violations within 48 hours by submitting detailed proof of resolution through the DSMS-APP. This includes textual descriptions of corrective actions, updated photographs, or short videos demonstrating rectification measures, and additional comments if required. Rejected resolutions shall be readdressed promptly as per feedback provided within the system.

3.5.2.8 Bidder shall actively monitor dashboards and reports generated by DSMS-APP to track unresolved issues and compliance trends, ensuring timely compliance.

3.5.2.9 Bidder shall utilize DSMS-APP to raise real-time alerts in emergencies requiring immediate action, providing accurate location data for response teams.

3.5.2.10 Bidder shall comply with the DSMS-APP data security protocols and ensure that only authorized personnel access the system using approved devices.

3.5.2.11 Bidder shall ensure their personnel including sub-contractors and vendors are equipped with laptops/ tablets/ smartphones (AndroidTM 11 or later) for use of the DSMS-APP. User/ Role based access to the system shall be provided. For Refinery revamps contracts, intrinsically safe smartphones are to be deployed.

3.6 AUTOMATED MANPOWER PRODUCTIVITY SYSTEM (MANPS)

3.6.1 Solution Overview

3.6.1.1 Automated web-based Manpower Productivity System (Active RFID/ BLE based), hosted in MeitY empanelled cloud data centre, will be provisioned and implemented by purchaser. The digital solution will be used for tracking of deployment/ mobilization of manpower including attendance/ variance in total mobilization, labour composition vs plan (skilled, semi-skilled, unskilled), average daily working hours, location tracking etc.

Active RFID/ BLE cards may be an addition to contractor's entry gate pass.

3.6.2 Bidders Obligations

3.6.2.1 Bidder shall support implementing MANPS by their employees and vendors'/ sub-contractors' employees and by utilizing the application.

3.6.2.2 Bidder shall furnish accurate details of all workers, name, gender, Photo ID Card No., skill levels (skilled, semi-skilled, unskilled), and vendor/ sub-contractor specific details, to the MANPS system at least four working days prior to mobilization.

Bidder shall consider Active RFID/ BLE cards equivalent to gate pass.

3.6.2.3 Bidder shall provide monthly projections of worker mobilization and demobilization for the next two months to ensure smooth operations.

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3.6.2.4 Bidder shall ensure that all bidder's, and bidder's vendors', sub-contractors' personnel/ workers wear the Active RFID/ BLE cards while inside the BPREP Project Area.

3.6.2.5 Bidder shall nominate representatives responsible for managing worker data, verifying card issuance, collecting cards and returning, changing of card battery, and addressing any system-related queries.

3.6.2.6 Bidder shall nominate representatives to attend mandatory MANPS training sessions and achieve proficiency in use of the same.

3.6.2.7 Bidder shall provide distribution of workers based on work allocation in the MANPS package.

3.6.2.8 Bidder shall use MANPS to track worker attendance, deployment and location, ensuring compliance with authorized areas and reporting and taking corrective actions for any unauthorized access detected by the system.

3.6.2.9 Bidder shall promptly update the MANPS system with details of demobilized workers and return their RFID/BLE cards daily to the MANPS solution provider as per process requirements. In case card is not returned, bidder will have to bear the actual cost of card incurred by BPCL plus admin charges in line with GCC.

3.6.2.10 Bidder shall report any lost or damaged RFID/BLE cards through the MANPS system and bear the cost of replacements (actual cost of card incurred by BPCL plus admin charges in line with GCC), as applicable. Also, the case of non-submission of the RFID/ BLE cards / lost RFID/ BLE cards shall require the contractor to lodge complaint at the local Police Thana and submit a copy of the same to BPCL Security.

3.6.2.11 Bidder shall utilize the dashboards and reports generated by MANPS for monitoring worker attendance, deployment w.r.t. skill level, location tracking, ensuring alignment with project requirements.

3.6.2.12 Bidder shall ensure all workers comply with the MANPS usage protocols.

3.6.2.13 Bidder shall obtain and maintain explicit consent from all their/ their vendors/ sub-contractor personnel/ workers for the collection, use, and processing of their data within the MANPS system, with compliance with relevant data protection regulations and project guidelines.

3.6.2.14 Bidder shall coordinate with the MANPS solution provider to ensure smooth integration of worker data into the MANPS system, flag any system-related issues promptly, and provide general cooperation for effective system operation.

3.6.2.15 Bidder shall coordinate their site works with purchaser's MANPS Solution Provider.

3.6.2.16 Bidder shall be responsible for watch and ward/safekeeping of devices deployed by MANPS Solution Provider within or near the B/L or contractors work area.

3.7 WAREHOUSE MANAGEMENT SYSTEM (WMS)

3.7.1 Bidder shall deploy Warehouse Management System and provide APIs/ Manual Data Entry (as necessary) for sharing information with purchaser's CT-CDE to facilitate a live view of the material availability in bidder's warehouse.

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3.7.2 Bidder shall provide all assistance and guidance to Purchasers CT/CDE Vendor to integrate the WMS with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period.

3.7.2.1 Bidder shall provide login credentials to Purchaser, MPMC and PMC/ EPCM to provide access to their WMS in case the bidder WMS is not able to integrate with Purchaser CT/ CDE or CT/ CDE is dysfunctional during the course of execution of the contract. Bidder may also have to provide manual entry in CT-CDE related to WMS in case of integration failure.

3.8 TRANSPORT MANAGEMENT SYSTEM (TMS)

3.8.1 Bidder shall deploy URL's for Viewing Physical Location on Key Materials, Long Lead Items (LLI's), ODC equipment etc. interfaced from Transport Management Solutions of Bidder's Vendor's (TMS shall be by bidder's OEMs/ Transporters)

3.8.2 Bidder shall provide all assistance and guidance to Purchasers CT/CDE Vendor to integrate the TMS with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period.

3.8.3 Bidder to also refer and comply to "PROCEDURE FOR SMART INTEGRATED ENGG., DIGITAL HANDOVER OF DRAWING/DOCUMENT/ 3D MODEL AND DIGITAL INTERVENTION BY BIDDER".

3.9 SPOOL MANAGEMENT SYSTEM

3.9.1 Bidder shall deploy and use Piping Spool Management System to reduce construction errors and delay during identifying, tracing and installing piping spools. The objective of the system shall be as under.

(i) Productivity and trackability improvement

(ii) Job tracking and availability of real time data capture

(iii) Better inventory control

(iv) Reducing the errors and associated cost in sending incorrect spools to site for installation

3.9.2 Methodology and controls: The general guidelines for piping spool management are stated below

(i) The Spool Tracing System shall work in alignment with DQIS where records for Piping Spool Fabrication, Erection , Alignment and Piping Quality Control (NDT Records, LHS etc) are maintained.

(ii) A unique numbering system for pipe-spools shall be developed. The system shall incorporate unit designation/ number, line number and spool sequence number as a minimum. The spool number shall be hard-punched on the pipe spool at conspicuous location.

(iii) All fabricated / completed spools shall be marked and identified using conventional multi-line bar code stickers which shall have information pertaining to spool number

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as well as traceable correlation to other parameters recorded in a database. Printed bar code stickers shall be properly fixed on to the pipe spools.

(iv) The barcode stickers fixed on spools shall be readable with the help of bar code readers and shall show a unique bar code serial number upon reading. The bar code shall be co-relatable to the spool number of the pipe.

(v) Apart from the above, spools shall be affixed with suitable RFID (Radio Frequency Identification) tags which can be read through a RFID scanner. The RFID system shall have search and Id capability and shall be co-relatable to spool number in the database

(vi) All Hardware, software, consumables, labour and supervision required for implementing the spool management system shall be provided by contractor at no extra cost. Contractor shall develop a detailed procedure incorporating the above suggested elements and submit the same to Engineer In-charge for approval before implementation.

3.9.3 Bidder shall provide direct access to 3 Nos. Users of PMC and 2 Nos. Users of Purchaser to the Spool Management System during the contract duration. Bidder shall also arrange training session to PMC and Purchaser personnel on using the system.

3.10 WELDING MANAGEMENT SYSTEM

3.10.1 Welding Management System shall assist in monitoring, tracking and recording of all Pining Welding Works to enable efficient management of piping welding activities. The solution shall work in sync with the Spool Management System deployed by the Bidder.

3.10.2 This digital solution consolidates the relevant piping drawings, PQR (Welding Procedure Qualification Record), and track data of number and quality of piping joints and productivity of welding team etc.

3.10.3 The Welding Management System deployed by the Bidder shall have the following broad functionalities:

(i) Marking of pipe spools
(ii) Joint numbering, field jointing identification including incorporation of revisions
(iii) Welding Workload, front analysis and balance work identification.
(iv) WPS/PQR (welding procedure specification, procedure Qualification Record)
(v) Welder performance reports
(vi) Welder list vis-a vis WPS.
(vii) Line History sheet for weld joints, flanged joints, traceability record
(viii) Hydrotest reports/ NDT Clearance (as applicable)
(ix) Line wise/ Area wise / loop wise final completion report
(x) Material appropriation/ traceability report
(xi) Manpower & consumable estimation for fit-up, welding, NDT etc.
(xii) Reallocation of fabricated spools etc.
(xiii) Re sequencing of welding joints
(xiv) Reports for Welding Progress Monitoring.

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3.11 CABLING MANAGEMENT SYSTEM

3.11.1.1 Bidder shall deploy a digital solution to consolidate the relevant cable schedules with detail of type and length, daily upload the progress on the system, generates cabling progress report

3.11.1.2 The Cabling Management System shall have functionalities for managing the entire site cabling works. The system shall identify the cable schedules with drum schedules, keep record of total length of cables in each drum as supplied, balance cable remaining after cutting of cables from the drum. The system shall also display the total length of each type of cables available at site.

3.12 COMMON SYSTEM FEATURES & FUNCTIONALITIES

3.12.1 BPCL cyber security guidelines as Circular IS24-25.1 and IS24-25.2 (attached) are to be followed for the integrated Digital Solutions under bidder's scope (Spool Management System, Welding Management System and Cabling Management System). Bidder shall also comply to the BPCL Cybersecurity Checklist (attached), BPCL Security Checklist for Cloud/ Third-party solutions (attached) and BPCL Security conditions in tender for purchasing Commercial software (attached).

3.12.2 Software applications, including 3rd Party applications, with valid licenses & support should only be deployed. Any liability arising out of any software non-compliance would strictly lie with the bidder.

3.12.3 Bidder is responsible for complete system architecture, setup and maintenance of all system software components including Operating System, Database Server, Security devices etc, as needed for robust performance and as per system performance standards in the SLA.

3.12.4 For all solutions providing file upload scenarios, following functionalities to be ensured:

(i) File upload should verify the file types. Only required file-types to be accepted by the application.

(ii) While uploading, files need to be scanned against malware. Solution should allow only clean files to be uploaded.

3.12.5 For APIs, following minimum security controls should be included: -

(i) Strong Authentication

(ii) Encryption

(iii) Rate limiting

3.12.6 All web-based applications/ dashboards etc. shall have feature of session auto-log out in case of idling of user by 10 min.

3.12.7 **PROVEN TRACK RECORD**

3.12.7.1 The digital solutions under bidder's scope (Spool Management System, Welding Management System and Cabling Management System) shall have been supplied or provided as managed solution (either cloud hosted or on premise) by bidder/ bidder's

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respective digital solution provider either by themselves or with support from any OEM(s), and each of the solutions shall have completed a period of minimum six (6) months after go-live.

3.12.8 In case bidder proposes to provide the digital solutions Spool Management System, Welding Management System and Cabling Management System through OEM(s)/ solution provider(s), following shall apply:

(i) Bidder shall furnish Manufacturer Authorization Certificate and Logistic Support letter from OEM(s)/ digital solution provider(s) of Spool Management System, Welding Management System and Cabling Management System confirming the following. The letter must be signed by OEM(s)/ digital solution provider(s) corporate level signatory on company letter head.

"The OEM(s)/ digital solution provider(s) assumes complete responsibility for their involvement with the bidder in all phases of work during the contract period like system engineering, cloud hosting, User Acceptance Test, Go-live, operation, maintenance, decommissioning and exit management."

3.12.9 **MANPOWER DEPLOYMENT**

3.12.9.1 Bidder shall deploy necessary manpower at the BPCL BR site dedicated for operation and maintenance and to provide support and assistance to users of Spool Management System, Welding Management System and Cabling Management System . The persons shall have minimum 2 years of experience in IT support. Bidder shall also be responsible for deploying additional personnel as per project exigencies.

4.0 ADHERENCE TO STANDARDS

4.1 QUALITY, SAFETY, DOCUMENTATION AND CYBERSECURITY

4.1.1 The bidder shall comply with the mentioned standards for the execution of the work as mentioned in the following clauses.:

(i) Quality Management System: Bidder shall comply to EIL Standard Specification for Quality Management System, 6-78-0001.

(ii) Documentation Requirements: Bidder shall comply to EIL Standard Specification for Documentation Requirements for Contractors 6-78-0002 and from Suppliers, 6-78-0003.

(iii) HSE Management and Safety Measures for Electrical Installations: Bidder shall comply to EIL Standard Specification for Health, Safety and Environment, 6-82-0001 and Safety Measures for Electrical Installations during Construction, 7-51-0332.

(iv) Cybersecurity Requirements: Bidder shall comply to BPCL's Cybersecurity requirements as per Circular. IS24-25.1, IS24-25.2 (attached), BPCL Security Checklist for Cloud/ Third-party solutions (attached) and BPCL Security conditions in tender for purchasing Commercial software (attached).

5.0 INTEGRATED ACCEPTANCE TEST (SAT)

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5.1 GENERAL

5.1.1 Bidder/ bidder's respective digital solution provider for Spool Management System, Welding Management System and Cabling Management System shall demonstrate the functional requirements of the respective digital solution to BPCL and EIL for acceptance.

5.1.2 Bidder shall furnish the SAT Procedure for Spool Management System, Welding Management System and Cabling Management System for BPCL/ EIL review prior to offering the respective digital solution for SAT.

6.0 LIST OF ATTACHMENTS

(i) EIL Standard Specification for Quality Management System, 6-78-0001

(ii) EIL Standard Specification for Documentation Requirements from Contractors, 6-78-0002.

(iii) EIL Standard Specification for Documentation Requirements from Suppliers, 6-78-0003.

(iv) EIL Standard Specification for Health, Safety and Environment, 6-82-0001

(v) EIL Standard Specification for Safety Measures for Electrical Installations during Construction, 7-51-0332

(vi) BPCL Cybersecurity requirements as per Circular. IS24-25.1

(vii) BPCL Cybersecurity requirements as per Circular. IS24-25.2

(viii) BPCL IT Security Compliance Check List

(ix) BPCL Security Checklist for Cloud/ Third-party solutions

(x) BPCL Security conditions in tender for purchasing Commercial software

(xi) KPI List

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KPI List for BPREP Control Tower for Package Contracts

Sr. No.	Category	KPI	Description	Frequency
1	Overview	Forecast commissioning date	Estimated date when the project/unit is expected to be operational	Fortnightly
2		Number of days to production start	Remaining days until production is scheduled to begin/Commissioning	Daily
3		Mechanical completion date	Remaining days to mechanical completion	Fortnightly
4	Progress	Progress S-curve	Progress S curve plan vs actual	Fortnightly
5		Work progress percentage	Percentage completion of actual versus planned progress	Fortnightly
6		Milestones achieved	Number of milestones completed on time versus planned milestones	Weekly
7		Critical path progress	Progress of tasks on the critical path and impact on project timelines	Fortnightly
8		Sub-critical path progress	Progress of tasks on the sub-critical path and impact on project timelines	Fortnightly
9		Schedule adherence rate	Percentage of tasks completed on time	As updated
10		Area of concern	Roadblocks with achieving the milestone	As updated
11	Cost	Cost s-curve	Cost S curve plan vs actual	Quaterly
12		Total cost	Total project expenditure and comparison of planned vs actual	Quaterly
13		Committed cost	Committed cost planned vs actual	Quaterly
14		Cost over run vs DFR	Savings or over run vs DFR estimate	Quaterly
15		Procurement cost	Total cost of procurement activities	Monthly
16		Procurement budget plan vs actual	Comparison of planned versus actual procurement expenditures	Monthly
17		Tendering cost	Contract tender cost	Monthly
18		Tendering budget plan vs actual	Comparison of planned versus actual tendering expenditures	Monthly
19	Procurement	Upcoming tenders	Number and status of upcoming tenders	Weekly
20		Live tenders	Number and status of current tenders	Weekly
21		RFP to PO timelines	Time taken from request for proposal (RFP) to Purchase Order (PO)	As updated
22		Change orders	Number and impact of change orders	Weekly
23		Payables status and aging	Status and aging of payables	Weekly
24		Equipment procurement plan vs actual	Percentage equipment procured against the plan	Weekly
25		Major critical equipment procurement status (LLI plus few non LLI)	Detailed plan status, including steps such as bidding, datasheet review, PR, and bid submission	Weekly

KPI List for BPREP Control Tower for Package Contracts

Sr. No.	Category	KPI	Description	Frequency
26		Bulk material status	Status of Material Procuement Categorywise	Weekly
27		Construction quantity release status	Categorywise Status of Release of Construction Qty.	Weekly
28		Contractor award plan vs actual	Percentage contractors awarded against the plan Contractors are the MEI, civil and structural and so on	Weekly
29		Contractor award detailed status	Comparison of the planned status, including stages like bid submission and contract finalization	Weekly
30	Engineering	Detailed engineering for each package	Status of Detailed Engineering (DE)	Weekly
31		BDEP status	Status of Basic Design Engineering Package (BDEP)	Weekly
32		FEED status	Status of Front-End Engineering Design (FEED)	Weekly
33		Number of datasheets received vs planned	Datasheets received compared to the planned number in the BDEP	Weekly
34		Drawing status	Current state of drawing approvals and completions	Weekly
35	Construction	Structural steel fabrication	Comparison of planned versus actual structural steel fabrication	Fortnightly
36		Piping fabrication	Comparison of planned versus piping fabrication	Fortnightly
37		Critical equipment delivery plan vs actual	Timeliness of delivery of critical equipment	Fortnightly
38		Equipment construction progress overview	Percentage equipment construction completed vs plan	Fortnightly
39		Equipment-wise construction progress	Actual progress of equipment construction post delivery at site	Fortnightly
40		Civil works completion	Measures the planned versus actual progress of civil construction works	Fortnightly
41		Structural assembly progress	Compares planned to actual progress in structural assembly	Fortnightly
42		Piping installation progress	Monitors the planned versus actual progress of piping installations	Fortnightly
43		Electrical installation status	Tracks the progress of electrical installations compared to the plan	Fortnightly
44		Insulation and cladding completion	Compares planned versus actual completion of insulation and cladding work	Fortnightly
45		Fireproofing application progress	Measures the actual progress of fireproofing applications against the planned schedule	Fortnightly

KPI List for BPREP Control Tower for Package Contracts

Sr. No.	Category	KPI	Description	Frequency
46		LSTK/Package contract progress statistics	Progress Statistics at the Contract and and Functional Levels for each Contarct	Fortnightly
47	Manpower Productivity	Manpower attendance	Tracking of manpower attendance with entry and exit times, and total working hours	Daily
48		Entry and exit time	Average manpower entry and exit times at the site	Daily
49		Contractor-wise manpower deployed	Number of manpower per contractor	Daily
50		Working hours	Total working hours of manpower based on attendance records	Daily
51		Supervisor and manpower turnover rate	Frequency of supervisor and manpower turnover	Fortnightly
52		Gang ratio: skilled vs unskilled	Ratio of skilled to unskilled manpower in the workforce	Daily
53		Contractor manpower productivity comparison	Comparison of contractor manpower productivity from best to worst performing	Weekly
54		Manpower downtime	Percentage of time manpower is not productive	Daily
55	Equipment Productivity	Number of critical equipment at site	Tracking of critical equipment at site	Daily
56		Critical equipment downtime	Downtime of critical equipment and its impact on the project	Daily
57		Equipment utilization rate	Percentage of time equipment is operational versus idle	Daily
58	Safety	Total Manhours Worked	Category wise and Total Manhours Worked	Daily
59		LTA Free Manhours	Category wise and Overll LTA Free Manhours	Monthly
60		Frequency Rate	Frequency Rate	Monthly
61		Severity Rate	Severity Rate	Monthly
62		No of Tool Box Talks Conducted	Category wise and Overll No of Tool Box Talks Conducted	Monthly
63		No. of Near Misses	Category Wise No. of Near Misses and Trends	Monthly
64		No. of Incidents	Category Wise No. of Incidents and Trends	Monthly
65		No. of NCR's/OSA	Instances of non-compliance with requirements or Safety Violations	Monthly
66		No. of non compliance/ safety violation detected by DSMS	Category wis e and Overall No. of non compliance/ safety violation detected by DSMS	Daily
67		No. of violations not resolved	Category wis e and Overall No. Vioations not resolved	Daily
68	Planning and Scheduling	Daily task completion rate - contractor comparison	Tracks the percentage of planned daily tasks completed	Daily
69	Quality	Overall status	Total inspections done vs total passed vs total defects area specific	Daily
70		Contractor Quality Assurance	Site Quality Check	

KPI List for BPREP Control Tower for Package Contracts

Sr. No.	Category	KPI	Description	Frequency
71		Supplier quality Assurance	Measures the quality of materials and equipment supplied by vendors	Daily
72		Number of non-conformance reports (NCRs)	Total no. and percentge of NCRs issued from inspections	Daily
73		Corrective action closure rate	Percentage of corrective actions closed out effectively	Daily
74		Failure rate of inspected items	rate at which inspected items fail quality criteria	Daily
75		Best and worst performing contractor	Contractor with minimum inspection failure and contractor with the maximum test failure	Daily
76		Field quality issues	Monitors the number of quality issues across each types	Daily
77	Warehouse and Management	Material and equipment availability status	Monitors the percentage of required materials that are available in the warehouse when needed	Daily
78		Criticial equipment availability status	Measures the availability of high-priority or critical materials required for project milestones	Daily
79		Order delay incidents	Tracks the number of delays in material orders and shipments	Daily
80	Transport Management	Risk of delay	Percentage of equipment at the risk of delay in delivery	Daily
81		Distance travelled vs total distance	For critical equipment: percentage distance covered	Daily
82		Touch points of the journey	Assesses adherence to planned schedules at critical touchpoints, such as ports, terminals, and warehouse	Daily
83	Commissioning	Piping loop hydro-testing status	MC, NDT, HT Status	Daily
84		System completion outlook	Format 1, 2 and 3 Status	Daily
85		Summary of system handing over status	Format 4	Daily

DESIGN BASIS

FOR

ACTIVE FIRE PROTECTION SYSTEM

OF

BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT

OWNER : M/s BPCL, BINA REFINERY

EPCM : ENGINEERS INDIA LIMITED

JOB NO. : B857

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BPCL **EIL**

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1 SCOPE

This document covers design basis for Active Fire Protection system for Bina Petrochemical & Refinery Expansion Project facilities of M/s BPCL, Bina refinery.

2 ABBREVIATIONS, CODES & STANDARDS / PUBLICATIONS

2.1 ABBREVIATIONS

CODE	DESCRIPTION
CCOE	Chief Controller of Explosives
DCP	Dry Chemical Powder
DGCA	Director General of Civil Aviation
FGL	Finished Ground Level
FM	Factory Mutual
NFPA	National Fire Protection Association
MVA	Mega Volt Amperes
OISD	Oil Industry Safety Directorate
PNGRB	Petroleum and Natural Gas Regulatory Board
P/L	Pipeline
3LPE	Three-layer Extruded polyethylene Coating
PESO	Petroleum and Explosives Safety Organization
UL	Underwriters Laboratory

2.2 CODES & STANDARDS / PUBLICATIONS

S. NO.	DESCRIPTION	STANDARDS / CODES
1.	Fire Protection Facilities for Petroleum Refineries & Oil/Gas Processing Plants	OISD- STD- 116
2.	Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Refineries and Gas Processing Plants) Regulations, 2023.	PNGRB/Tech/8-T4SR&GP/ (1)/2023 (P-4247)

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S. NO.	DESCRIPTION	STANDARDS / CODES
3.	Fire Protection System for Electrical Installations	OISD- STD-173
4.	Standard for Unloading, Storage and Regasification of Liquefied Natural Gas (LNG)	OISD- STD-194
5.	Design, Layout, Operation & Maintenance of Refrigerated LPG Storage	OISD- STD-236
6.	Design and Safety Requirements for Liquefied Petroleum Gas Mounded Storage Facility	OISD- STD-150
7.	Standard for Low-, Medium-, and High-Expansion Foam	NFPA 11
8.	Standard on Carbon Dioxide Extinguishing Systems	NFPA 12
9.	Standard for Water Spray Fixed Systems for Fire Protection	NFPA 15
10.	Standard for Dry Chemical Extinguishing Systems	NFPA 17
11.	Standard on Clean Agent Fire Extinguishing Systems	NFPA- 2001
12.	Codes for Fire Fighting Equipment's	BIS/UL/FM
13.	Process Licensors requirement	As applicable
14.	Client specific requirement, if any	

2.3 STATUTORY PROVISIONS

a. Petroleum Rules (for Hydrocarbon Storage under Chief Controller of Explosives of PESO)

b. Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Refineries and Gas Processing Plants) Regulations, 2023.

c. The Static and Mobile Pressure Vessels (unfired) rules- (For Pressure Storage of gases under Chief Controller of Explosives)

d. Gas Cylinder Rules (for filling and handling of gas cylinders under Chief Controller of Explosives)

e. The Building and Other Construction Workers Act (BOCW act Latest Edition)

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3 DESIGN PHILOSOPHY / CRITERIA - GENERAL

3.1 FIRE WATER SYSTEM

The various details regarding systems design, type of storage, material of construction etc. shall be covered in the fire protection design basis. Refer Section 4.0

4 FIRE PROTECTION SYSTEM

4.1 GENERAL

This specification described below gives minimum design and functional requirements for active fire protection system. The Active Fire Protection system shall be conceived to operate both in prevention and fighting mode, depending on the relevant actions selected, either manual or automatic.

The firefighting shall be based on the following fighting agents.

- Fire Water (Fresh Water)
- Foam
- Clean Agent System
- DCP/CO_2

4.2 DESIGN PHILOSOPHY

4.2.1 GENERAL

Sl. No	EIL PHILOSOPHY
1.	The Fire protection facilities shall be designed by extending the existing fire water network of refinery to cover the new facilities envisaged under BPREP Project. Existing Fire Water system adequacy shall be checked for catering to fire water demand of proposed facilities in combination with existing facilities.
2.	Process units, storages, utilities etc. shall be fully covered by hydrants and Monitors system with isolation valves as per OISD-116 / PNGRB (whichever is more stringent shall be followed), design requirements, safe engineering practices and process licensor's requirements & client specific requirements.
3.	Fire Protection facilities shall be designed to fight two major fire scenarios simultaneously anywhere in the complex.
4.	Roof Sinking case for external floating roof tanks shall be considered as per OISD-116 / PNGRB standards.
5.	New Hydrocarbon storage tanks shall be protected with water spray, fixed foam

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Sl. No	EIL PHILOSOPHY
	system (as per client requirements) and automatic actuated rim seal protection for external floating roof tanks storing class-A petroleum as per OISD / PNGRB standards (hollow metallic tube type).
6.	Dyke area/spill fire protection as per OISD-STD-116/PNGRB standards.
7.	Fire fighting system for transformers shall be as per Electrical Design Basis.
8.	Computer room, Console room, Rack room, Engg. Room, UPS room, Battery room, etc. of process control room / SRR shall be protected by clean agent system as per OISD, PNGRB & NFPA-2001.
9.	For process plants, OISD/PNGRB requirement and licensor's recommendations shall be followed.
10.	Mounded bullets shall be protected with water spray system as per OISD-STD-150.
11.	Fire protection facilities will be based on following: ➢ Monitoring and Alarm by alerting, locating fire and operating advise ➢ Detection of fire and toxic gas ➢ Action by water/ foam/ CO_2/ Clean agent/ DCP ➢ Communication system (As per Electrical EDB) ➢ Portable Fire Fighting equipment ➢ Mobile Fire Fighting equipment ➢ First Aid Fire Fighting equipment
12.	DWST storage tanks shall be protected with fixed water spray system and N_2 Snuffing system as per OISD-STD-236 / OISD-STD-194, as applicable.
13.	DWST storage tanks shall be protected with High Expansion Foam Generator system as per OISD-STD-236 / OISD-STD-194, if applicable.

4.2.2 DESIGN CRITERIA FOR VARIOUS FACILITIES IN PROCESS UNIT HANDLING HYDROCARBON

S. No	DESCRIPTION	EIL PHILOSOPHY
1.	Water Application Rate for process unit (General) for spray system	As per OISD-116/PNGRB

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S. No	DESCRIPTION	EIL PHILOSOPHY
	➢ Pumps handling petroleum products Class 'A' under pipe racks ➢ Pumps handling products above auto-ignition temperature under pipe racks.	Water spray system as per OISD-116 / PNGRB & process licensor's requirement.
	➢ Vessel: Un-insulated of capacity over 50 m^3 and containing class A or B flammable liquid. ➢ Un-insulated Flare KOD having any capacity ➢ Vessel inaccessible to Fire Tender/mobile equipment, fire hydrant.	Water spray system as per OISD-116 / PNGRB & process licensor's requirement.
	➢ Air Fin Coolers for Hydrocarbon services located above Pipe rack /Elevated location	Water spray system as per OISD-116 / PNGRB.
	➢ Columns and Reactors of height more than 45 m	Water spray system as per OISD-116 /PNGRB & process licensor's requirement.
	➢ Water application rate for protected equipment with deluge system	Refer OISD-116 / PNGRB
	➢ Compressor (Hydrogen / Hydrocarbon)	Water Spray system as per OISD-116 / PNGRB.
	➢ Wet Risers	Elevated platforms/ Tall towers.
	➢ Landing Valves	On technological structures/Building Stairs.
2.	Hose Reels	With each landing valves & at 40 m distance along pipe rack within unit (If internal fire water header required).

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S. No	DESCRIPTION	EIL PHILOSOPHY
		Pump slab areas & exchanger slabs.
3.	First Aid Equipment	As per OISD / PNGRB standards.
4.	Water Monitors and Hydrants	As per OISD / PNGRB standards & additionally hydrant at 30m distance along pipe rack (If internal fire water header required).
5.	High-volume long-range variable flow Water Monitor/Water cum Foam Monitor (Manual/Remote Operated)	As per OISD-116 / PNGRB (boosting arrangement shall be provided if adequate pressure is not available) Elevated HVLRM shall be provided to protect column more than 30 m height. MOV of Remote operated HVLRM shall be accessible from Grade. Manual / Remote operated HVLRM (Aqua & Jet type) shall be provided & shall be BIS Approved/ UL listed or FM/VDS approved. HVLRM panel shall be as per electrical hazardous area classification.
6.	TEAL Handling area	Automatic DCP flooding system as per NFPA 17.
7.	Peroxide building & Peroxide preparation area.	Water Mist system as per NFPA 750.

4.2.3 DESIGN CRITERIA FOR VARIOUS FACILITIES IN OFFSITE FACILITIES

S. No	DESCRIPTION	EIL PHILOSOPHY
1.	Flammable Storage Tanks	
	➢ Fixed Water Spray system ▪ Floating roof or Fixed roof tanks storing Class A petroleum storage. ▪ Floating roof tanks of dia. larger than 30 m	As per OISD-116 / PNGRB

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S. No	DESCRIPTION	EIL PHILOSOPHY
	storing class B petroleum storage. ▪ Fixed roof tanks of dia. larger than 20 m storing class B petroleum storage	
	➢ Semi-fixed foam system ▪ Floating roof tanks storing Class 'A' and 'B' petroleum products ▪ Fixed roof tanks storing Class 'A' and 'B' petroleum products. ▪ Fixed roof tanks storing class 'C' petroleum products of dia. larger than 40 m. ➢ Semi Fixed Foam System should not be provided for fixed roof tanks operating at more than 0.6 psi pressure and where the tanks are nitrogen or other inert gas blanketed. ➢ In fixed roof tanks storing high-viscosity liquids in temperature above 93.3°C (200°F), fixed foam system should not be provided.	As per OISD-116 / PNGRB
	➢ External Floating roof tanks containing Class 'A' hydrocarbon.	Automatic actuated rim seal fire detection and Extinguishing system. (Rim seal fire protection system shall be installed as per OISD-116, Clause No. 4.2.3)
2.	DWST storage tanks.	Automatic water spray system, High Expansion Foam Generator and N_2 Snuffing system as per OISD-STD-194/OISD-STD-236, if applicable
3.	Loading/Unloading Gantries and Hydrocarbon Compressor area.	Automatic deluge system as per OISD-116 / PNGRB

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S. No	DESCRIPTION	EIL PHILOSOPHY
4.	Transformers (rating more than 10 MVA & above)	Asper Electrical DesignBasis
5.	➢ Buildings & Other Miscellaneous Structures	As per PNGRB & OISD
	➢ Process building/ structure	Landing valves
	➢ Multi storied buildings at first floor and above at sub-stations with cellars	Landing valves & Hose Reel
	➢ First Aid Equipment's	As per OISD / PNGRB standards
	➢ Process Control room/SRR	Clean agent system as per NFPA-2001 and Portable extinguishers as per OISD-116 / PNGRB
	➢ Detection & Actuation	As per OISD-116 & PNGRB (Refer electrical & instrumentation specification)
6.	Lab Building	▪ Portable Clean agent fire extinguishers. ▪ Sprinkler System as per NFPA-13. ▪ Portable fire extinguishers as per OISD Std. / PNGRB Regulations. ▪ Fire protection as per OISD-STD-211.
7.	Polymer Warehouse	▪ Sprinkler System (In rack Sprinkler with ESFR nozzle) as per NFPA-13. ▪ Portable fire extinguishers as per

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S. No	DESCRIPTION	EIL PHILOSOPHY
		OISD Std. / PNGRB Regulations. ▪ Internal Hydrants System.
8.	Equipment (Acoustic enclosure-based compressor/ Turbine etc.).	▪ CO_2 flooding system as per NFPA - 12.

4.3 FIRE WATER HYDRANT SYSTEM

4.3.1 NETWORK SIZING

S. No	EIL PHILOSOPHY
1.	The Fire water network shall be designed by extending fire water network to cover the new facilities envisaged under BPREP Project. Only the ring main for the new facilities shall be extended by taking tapping from the existing network and hydraulics of that section will be checked. If required, capacity of complex fire water system (storage / pumps) shall be increased based upon the revised fire water demand.
2.	Network shall be designed as per OISD-116 / PNGRB.
3.	Firewater demand & foam shall be calculated as per OISD-116 / PNGRB requirement. Roof sinking case of floating roof tank shall also be considered while calculating fire water demand.
4.	Fire water main network shall be analyzed for 120% of design water rate using "PIPENET" software. The velocity in the system should not exceed 5 m/sec. with minimum residual pressure at hydraulically remotest point as 7 kg/sq.cm g.
5.	Hydrants / Monitors shall be located along road side berms for easy accessibility as per OISD-116 & PNGRB.
6.	Fire hydrants around the tank shall be provided with 4” size pumper connection.

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4.3.2 SYSTEM DESCRIPTION

S. No	EIL PHILOSOPHY
1.	➢ Underground ring main network system shall be laid with one meter earth cushion and above ground ring main network shall be laid on sleepers, 300 to 500 mm above FGL, independent of process lines near to road side. In crane movement areas, FW pipes should be protected with concrete/steel encasement. Underground ring main network system shall be done as per OISD 116 Clause No. 5.6.2, 5.6.3 & 5.6.4 ➢ Flushing connection with isolation valve and pressure gauge points shall be provided at critical locations. ➢ Network shall be laid in a closed loop. The firewater header and branch lines shall be laid above ground on independent sleepers for offsite and utilities areas. For road crossings, the fire water header shall be laid underground.
2.	New firewater header and branch lines shall be laid above ground on independent sleepers for units, offsite and utilities areas. OISD-116 shall be used for underground / aboveground firewater header. All the underground firewater header shall have suitable corrosion protection.
3.	The minimum header size for hydrant and monitor branches shall be as under:
	Hydrant connection -4”/6”
	Water Monitor/Foam Monitor connection -6”
	High-Volume Long-Range Monitor Connection -8”/10”/12”
	Minimum Size of Network: 8”- Utility area and Non plant building area. 12”- Process area & Other Hydrocarbon Handling Facilities.
4.	At least 10% of all welded joints shall be radio-graphed and at least 50% of welded joints selected for radiography shall be field joints.
5.	Above ground fire water piping shall be painted as per OISD/ painting specification.
6.	All fire water networks shall be hydro tested to a pressure 1.5 times the shut off pressure of firewater pumps.

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4.3.3 ISOLATION VALVES

S. No	EIL PHILOSOPHY
1.	Isolation valves shall be provided at crossings (Junctions) to ensure easy maintenance and uninterrupted water supply in case of break down (as per OISD-116 / PNGRB).
2.	Isolation valve shall also be provided below each monitors and hydrants. Isolation valves shall be provided for all landing valves in technical structures/buildings and at base of riser pipe. Additional Isolation valve shall be provided at tapping points on firewater header if fire equipment is located more than 15m from firewater header.
3.	Isolation valve shall be provided at all tapping points on firewater header.
4.	Additional isolation valves shall be provided in segments where length of segment exceeds 300 m. Firewater pumps should be segregated in two groups by providing an isolation valve on common discharge header of pumps for ease of maintenance.
5.	Only carbon steel valves shall be used. No cast iron valves shall be used. All valves for fire water system shall be Gate Valve. Gate valves more than 16" shall be provided with gear mechanism.

4.3.4 RESTRICTION ORIFICE

S. No	EIL PHILOSOPHY
1.	RO at Hydrant/Landing outlets to reduce the pressure to 7 kg/cm2(g) at ground level wherever required.
2.	RO at tapping of fire water MV spray system and HV spray system shall be provided to keep the system pressure within range of 1.4 to 3.5 bar(g) and 3.5 to 5.0 bar(g) respectively.

4.4 FIRE FIGHTING EQUIPMENT

4.4.1 GENERAL

Hydrants or water monitors shall be located keeping in view the fire hazards at different sections of premises to be located and to give most effective coverage confirming to OISD-116 / PNGRB.

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4.4.2 HYDRANTS

Hydrant shall be provided at 30 m of external perimeter of process units, storage tank areas, Gantry area, hydrocarbon pumping station/ house, blending station etc. and one hydrant at every 45 m of external perimeter of utilities & Non-Plant Building area.

Hydrants shall be located at a minimum distance of 15 m from the periphery of storage tanks or hazardous equipment under protection. In case of buildings this distance shall not be less than 5 m and more than 15 m from the face of building.

Hydrants around the tanks shall be provided with 4” pumper connection. Hydrants shall be generally located with branch connection and not directly over main header along road side berms for easy accessibility as far as possible.

Hydrants with two separate landing valves (Type A) with instantaneous female coupling of 2 1/2 " size on 4” stand post (6”stand post for hydrant with pumper connection) shall be used. All Hydrant outlets shall be situated at a workable height of about 1.2 m above ground level. Hydrants connections shall be designed to meet the required flow and volume. Hydrant shall be BIS approved with following detail -

S. No	DESCRIPTION	VALUE
1.	Outlet	Double headed with two separate landing valves (Type A as per IS:5290)
2.	Type	Oblique angle type
3.	Capacity	900 lpm each valve
4.	Approval	BIS

4.4.3 LANDING VALVES

Landing valves (Two numbers of Type A as per IS: 5290) with instantaneous female coupling of 2 1/2 " size on 4” horizontal post shall be provided on the landings of first floor and above at each landing levels on all the buildings / tech structure / platforms etc.

S. No.	DESCRIPTION	VALUE
1.	Outlet	Double headed two separate landing valves (Type A as per IS:5290)
2.	Capacity	900 lpm each valve
3.	Type	Oblique angle type

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S. No.	DESCRIPTION	VALUE
4.	Approval	BIS

4.4.4 HOSE CABINET AND HOSE REEL

Hose cabinet shall be installed at every alternate hydrant point and every landing valve. 2 nos. hoses 15m long each shall be kept in each hose cabinet. Hose cabinet shall be installed for every Hydrant below pipe rack in process units. Hoses shall be reinforced rubber lined hose as per IS: 636 (Type 3). Hose reels shall be provided with flanged connection.

S. No.	DESCRIPTION	
1.	Hose Box	
	➢ Type	Type II as per EIL specification
	➢ Hose Size	63 mm & 15 m long
2.	Hose reel	
	➢ Length	40 m
	➢ Bore size	25 mm

4.4.5 MONITORS

Water Cum Foam Monitors shall be located at strategic locations for protection of cluster of columns, heaters, gassifiers and other high structures, where it may not be possible to approach the higher levels. A minimum of two monitors shall be provided for each such area. Monitors should not be installed less than 15 m from hazardous equipment to be protected.

Monitor tip height shall be approachable.

S. No	DESCRIPTION	VALUE
1.	Capacity	500-750-1000 US GPM (Variable Flow)
2.	Nozzle Type	Non-aspirating type with arrangement of jet and spray (aqua fog)
3.	Approval	BIS approved/ UL Listed/FM Approved

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4.4.6 FIXED REMOTE / MANUAL OPERATED HIGH VOLUME WATER CUM FOAM MONITORS

Min. 2 nos. of Remote / Manual operated high-volume long-range water cum foam monitors (with JRCP connection / ILBP, as applicable) shall be variable flow type, with foam induction along with foam storage tank (Delivery rates for 10 minutes) to monitor being possible from minimum 60 m distance from the monitor and shall be provided in (as per OISD-STD-116 Clause 5.7.4):

a. Inaccessible areas such as column, reactor and compressor house in Process Units.
b. Critical equipments at higher locations (above 30 m.)
c. HVLRs to be located such that throw of the monitors is safely delivered at the aimed object. Location of monitors shall not exceed 45 m from the hazard to be protected.
d. Tank Farm area

S. No	DESCRIPTION	VALUE
1.	Capacity	1000-2000 US GPM (Variable Flow) and above
2.	Nozzle Type	Non-aspirating type with arrangement of jet and spray (aqua fog)
3.	Horizontal range	As per Data Sheet
4.	Approval	BIS Approved/ UL listed / FM Approved

Note:

i. Localized Fixed Foam system is applicable for tank farm only (New Storage Tanks).
ii. Foam provision not required for elevated monitors located within unit.
iii. Foam Feeding system without foam storage to be consider for monitor located at grade level in and around unit.

4.5 WATER SUPPLY AND STORAGE

S. No.	Description	EIL Philosophy
1.	Supply	Existing
2.	Storage capacity	Existing (New FW Storage Tanks may be added based on the FW Adequacy Report)

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4.6 FIRE WATER PUMPS

MAIN PUMPS AND JOCKEY PUMPS

S. No.	Description	Philosophy
1.	Capacity	Existing (New FW Pumps may be added based on the FW Adequacy Report)
2.	Type	Existing

4.7 FIRE WATER PUMP HOUSE

Existing (New FW Storage Tanks / Pumps may be added based on the FW Adequacy Report)

4.8 FIRE WATER SPRAY SYSTEM

S. No	EIL PHILOSOPHY
1.	Water spray system shall be provided on proposed hydrocarbon tanks, process equipment, etc. shall meet the requirements of OISD-116 / PNGRB standards. The rate of water applications & mode of operation shall be as per Sec. 4.8.1 of this document and as per process licensor's requirement.
2.	Water spray on Hydrocarbon storage tanks shall be provided with two tapping's, each for 100% flow from two different main headers. Water spray on equipment, vessel, column, air fin cooler and pumps within the process unit shall have single connection from main header for 100% flow with bypass valve in Deluge System.
3.	While providing water spray on equipment's/ vessels, Air fin coolers, columns, special care shall be taken to provide water spray on flanges of nozzle connected to equipment's / vessels.
4.	Break up flange shall be provided for Water Spray System rings and header for easy replacement as per the requirement.
5.	Firewater spray for storages (Bullets, DWST) shall be provided with two tapping, each for 100% flow from two different main headers.

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S. No	EIL PHILOSOPHY
6.	All spray tapping shall be taken from top instead of existing side/bottom tapping to prevent under deposit corrosion in line by stagnant water.

4.8.1 RATE OF WATER APPLICATION & MODE OF OPERATION OF WATER SPRAY SYSTEM

I. OFFSITE

S. No	FACILITIES	MODE OF OPERATION	RATE OF APPLICATION
1.	Hydrocarbon Storage tanks	As per OISD / PNGRB standards	As per OISD / PNGRB standards
2.	Mounded bullets and piping manifolds		
3.	LPG Pump house		
4.	Above ground pressurized storage (Bullets)		
5.	Road Dispatch Facilities		
6.	Refrigerated DWST Tanks		
7.	Hydrocarbon/Hydrogen Compressors		
8.	Condensers heat exchangers, Evaporators and Blender		

II. PROCESS UNIT HANDLING HYDROCARBON

S. NO.	FACILITIES	MODE OF OPERATION	RATE OF APPLICATION
1.	Pumps handling petroleum products class 'A' under pipe rack or above auto-ignition temperature under pipe racks	Auto (Deluge system)	20.4 lpm/sqm.

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S. NO.	FACILITIES	MODE OF OPERATION	RATE OF APPLICATION
2.	Other equipment's as per licensor	Manual /Auto (Deluge system)	As per licensor
3.	Tall column of height more than 45 m	Auto (Deluge system)	10.2 lpm/sqm.
4.	Un-insulated vessels having capacity larger than 50 m^3 and containing class A or B flammable liquid.	Auto (Deluge system)	10.2 lpm/sqm.
5.	Air fin coolers in hydrocarbon service located above pipe racks / elevated location	Auto (Deluge valve) up to 182 ℃ operating temp. of process fluid at inlet of air fin cooler Manual, above 182 ℃ operating temp. of process fluid at inlet of air fin cooler	10.2 lpm/sqm.
6.	Hydrocarbon Compressors	Auto (Deluge system)	20.4 lpm/sqm.
7.	Uninsulated Flare KOD	Auto (Deluge system)	10.2 lpm/sqm.

NOTE:

i. All the Automatic Fire water spray system shall have manual start facility in case of failure of auto system.

ii. Booster pump (including standby) shall be provided in case of wherever pressure boosting in firewater line is required.

4.9 FOAM SYSTEM ON NEW HYDROCARBON STORAGE TANKS

S. NO.	DESCRIPTION	EIL PHILOSOPHY
1.	Type of foam	Low and medium expansion Aqueous Film Forming Foam (AFFF) based.
2.	Operation	Manual
3.	System type	Fixed
4.	Application time	As per OISD / PNGRB
5.	Foam solution	3-6% foam

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S. NO.	DESCRIPTION	EIL PHILOSOPHY
6.	Foam solution application rate	
	➢ Fixed roof and cone cum floating roof tanks	5 lpm/sqm of liquid surface area of the tank to be protected
	➢ Floating roof tanks	▪ 12 lpm/sqm of seal area with foam dam height of 600 mm. ▪ 8.1 lpm/sqm of liquid surface areas for roof sinking case.
7.	Rim Seal Fire Protection	All Class 'A' External Floating roof Tank

Note: Fixed Foam system shall be provided for New Storage Tanks with localized Foam Pump / Storage as per client requirements.

4.10 CO_2 FIRE EXTINGUISHING SYSTEM

Equipment's (acoustic enclosure-based compressor/ Turbine etc.) shall be provided with CO_2 fire extinguishing system as per NFPA-12.

4.11 DCP FIRE EXTINGUISHING SYSTEM

Automatic Total Flooding Dry Chemical Powder (DCP) System shall be provided for fire extinguishing to TEAL storage area as per NFPA-17/ licensor's recommendations with additional local DCP Hose Reel will be kept for flange joints, piping etc.

In TEAL handling and storage area, DCP powder shall be suitable for TEAL fire. TEAL storage facility should have provision for covering from all sides by shutters or other alternate means so that in case of DCP flooding, oxygen depletion should be as per NFPA-17/ licensor's requirements.

4.12 WATER MIST SYSTEM

The Water Mist suppression system shall be provided for the protection of the Peroxide Storage & Peroxide Preparation Room through zoned application system. The system shall be actuated from the detection panel/junction box, high pressure water mist system will consist of a number of nozzles connected by stainless steel piping to a high-pressure water source either stored pressure (cylinder units) or continuous pressure (pump units).

Fire source must be enveloped by sufficient density of water fog. This shall be achieved by dispersion type nozzle sprayers positioned to give total coverage of the hazard envelope.

The system design shall be as per NFPA-750.

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4.13 HIGH EXPANSION FOAM GENERATOR SYSTEM

High expansion foam generators shall be provided on Refrigerated DWST facilities to meet the requirements of OISD-STD-236/OISD-STD-194/PNGRB Regulations.

The system design shall be as per NFPA-11.

4.14 LOCAL FOAM COMPOUND STORAGE

One no. above ground foam storage tank (local) of sufficient capacity with pumping facilities should be provided locally.

4.15 MATERIAL OF CONSTRUCTION

Pipes, fittings	As per PMS
Valves and flanges	As per PMS/ VMS
Spray nozzles	SS-316 (UL / FM / Vds / LPCB Approved)
Deluge valves	Ductile Iron (UL / FM / Vds / LPCB Approved)
Detector piping	As per PMS
Hydrant, landing valves	Stainless steel (Grade IV as per IS:3444) (BIS Approved)
Hose Boxes and Accessories:	Type II as per EIL specification
Hose reels	Hub / Sides: Mild Steel. Hose reel valves and nozzles: Stainless steel (Grade IV as per IS:3444)
Variable Flow Water Monitor/ Water cum Foam Monitors	Stainless steel (Grade IV as per IS:3444 or SS 316 (As per applicable code) (BIS approved / UL Listed/ FM Approved).

Note: For further details regarding MOC, refer respective specification / datasheet.

4.16 CLEAN AGENT FIRE EXTINGUISHING SYSTEM FOR PROCESS CONTROL ROOM / SRR

S. NO.	EIL PHILOSOPHY
1.	Clean agent (Inert gas) fire extinguisher system shall be provided as per NFPA-2001 in Process control rooms and SRR buildings (both blast resistant and non-

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S. NO.	EIL PHILOSOPHY
	blast resistant buildings).
2.	The system shall be automatic and detection and actuation shall also meet the requirement of NFPA 2001.

4.17 FIRST AID FIRE FIGHTING EQUIPMENT'S

S. No.	Philosophy (Fire Extinguisher)
1.	Dry chemical powder (DCP) fire extinguishers- 6 kg / 9 kg capacity: The extinguishers shall be located at strategic points at grade and on the platforms of structure based on maximum travel distance of 15 m or at least one fire extinguisher shall be provided for every 250 m^2 of hazardous operating area.
2.	Dry chemical powder (DCP) fire extinguishers- 50 kg capacity: The wheeled extinguishers shall be located at strategic points near hazardous equipment such as transformer area, lube oil tank, turbine generator and hydrocarbon pumps etc. At least one fire extinguisher shall be provided for every 750 m^2 of hazardous operating area.
3.	CO_2 extinguishers- 4.5 kg capacity: To be located in substations, power stations, office buildings, SRR and control rooms etc. The number of fire extinguishers shall be determined based on the maximum traveling distance of 15 m. At least one fire extinguisher shall be provided for every 250 m^2 of hazardous operating area.
4.	Water Mist cum Compressed Air Foam System: 50 liters trolly mounted water mist cum compressed air foam technology should be used to fight fire at critical location such as hot pumps handing fluids above auto ignition temperature.

NOTE: DCP & CO_2 Fire extinguisher of various capacity will be provided as per OISD & BIS standard.

4.18 MOBILE FIRE FIGHTING EQUIPMENT'S

Existing Mobile firefighting equipment. However, client to confirm any additional requirements.

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4.19 OTHER FIREFIGHTING EQUIPMENT'S

Firefighting Equipment's given below shall also be considered as per OISD-116 / PNGRB in sufficient quantity.

- Self-Contained breathing apparatus sets for 45 minutes operation
- Hoses - Synthetic hose of Type-III IS 636.
- Portable gas detectors, Emergency lighting etc.
- Chemicals - DCP and foam compound.
- Communication equipment - Manual call Points, Public address System, Fire siren etc.

5 SPECIFIC REQUIREMENTS

a. Powder used in DCP type Fire Extinguishers shall be 90% Mono Ammonium Phosphate (ABC) based and BIS marked.
b. Thickness of body plate used in 9 Kg. Capacity DCP Fire extinguishers shall be minimum 2 mm.
c. Thickness of body plate used in 25/50 Kg. Capacity DCP Fire extinguisher shall be minimum 5 mm.
d. Foam / water type extinguisher shall not be provided. Only DCP/CO_2 type extinguisher shall be provided. Fire extinguisher shall be stored pressure type.
e. All monitors including long-range monitors shall be non-aspirating type with arrangement of jet and spray (Aqua & Fog). Monitors shall have 360^0 rotations.
f. Hose couplings and other accessories (i.e. Jet Nozzle, Universal Branch pipe etc.) kept in hose boxes shall be fitted with stainless steel (Grade IV as per IS:3444).
g. Hose reel (Type B) shall be considered for below pipe rack / Pump slab areas & exchanger slabs in process units.
h. Fire Extinguisher caps & drain cap shall be made of stainless steel.
i. Self-contained breathing apparatus (Carbon Composite) sets for 45 minutes operation (35 minutes working time +10 minutes escape time), carrying harness, face mask and necessary regulator.
j. Booster pump (Electrical Driven) with emergency power supply shall be provided in case of wherever pressure boosting in Fire water line is required on case-to-case basis. One standby booster pump shall also be provided. Suction of booster pump to be taken from two distinct headers. Pump suction pressure of 7 Kg/cm^2 g shall be considered for designing of pumps (If required).
k. Foam storage tank shall be made of stainless steel (SS 316) with all accessories.
l. Sand filled buckets shall be provided near to transformers.

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m. In offsite area, additional hydrant outlet shall be provided where fixed foam connection is provided.

n. In water spray system, all the take off's shall have strainers.

o. Process equipments like exchangers, pumps, vessels shall be protected with fire water hydrant and monitors with isolation valve.

p. Cabinets to be provided for Portable Fire extinguishers.

q. Active Fire Protection for Cooling Towers as per applicable clauses of NFPA -214 shall be provided.

r. Fixed Medium Expansion Foam Generator (MEFG) shall be provided for New Tank Farms.

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SCOPE OF WORK & JOB SPECIFICATION (ELECTRICAL)

ELECTRICAL HEAT TRACING SYSTEM

PROJECT : **OVERALL PROJECT MANAGEMENT AS MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP**

CLIENT : M/s BPCL-BINA REFINERY

CONSULTANT : ENGINEERS INDIA LIMITED

JOB NO. : B957

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
A	17.03.2026	ISSUED WITH TENDER	SK	RSR	RSR

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1. INTRODUCTION

1.1 The intent of this specification is to define the requirements for the supply of equipment and materials, installation, testing and commissioning of Electrical Heat Tracing system of BPREP Project of M/s BPCL.

1.2 The work shall be carried out in the best workmanship-like manner, in conformity with these specifications, approved drawings and the instructions of the Owner and Engineer-in-Charge.

1.3 The contract scope shall include clearing of temporary constructions, waste materials and loose earth, which might get collected in and nearby the work site consequent to the execution of work under this contract.

2. SPECIFICATIONS & STANDARDS

2.1 The work shall be carried out in conformity with attached EIL specifications and standards.

2.2 In case of any contradiction between various referred standards/ specifications / data sheets/ documents and statutory regulations, most stringent shall govern. Owner's decision in this regard shall be binding & final. It is Contractor's responsibility to bring the same to the notification of EIL.

3. SITE CONDITIONS

The equipment offered and the installation shall be suitable for continuous operation under the following site conditions:

Ambient temp	:	Max. 48ºC, Min. 1.1ºC
Minimum temp. for Heat Tracers	:	1.1ºC
Applicable temp. for Heat Tracers	:	Maintenance temp, operating temp, design temp, exposure temp as per line List/ equipment list attached elsewhere
Design temperature for Other Electrical equipments	:	45ºC
Max relative humidity	:	86%
Altitude	:	Less than 1000m above MSL
Atmosphere	:	Humid & highly corrosive as found in Refineries & Petrochemical Plants

4. SYSTEM CONDITIONS

4.1 415V, 50Hz TPN power supply feeders of adequate rating shall be available in the Owner's switchboard in the Owner's substation for feeding heat tracing system flameproof Power distribution boards (PDBs) / flameproof Load distribution panels (LDPs).

Complete power distribution from owner's substation to 415V PDB / LDP onward including power cables, control cables, heat tracers/ tape, JBs, RTDs, Multi circuit temperature controller, cabling, termination, earthing, FO/CAT-6 cable, necessary connectors etc. is included in Contractor's scope and shall be included in SOR items. Temperature controller provided in LDP shall be connected with central monitoring system (to be located in MCR) through FO/CAT-6 cable for monitoring purpose.

Exact power distribution scheme from substation/ feeders onwards shall be finalized By Contractor in consultation with Owner/EIL during detail engineering based on actual heat tracing load and location of heat tracing PDBs/ LDPs & Owners substation.

4.2 Bidder shall furnish load requirements, details, quantity and rating of LDP and PDB required for feeding the electric heat tracers in the bid. Bidder shall also indicate in the offer, rating & quantity of the owner's feeder(s) required for feeding the offered heat tracing system.

4.3 Bidder shall supply, install & terminate all power & control cables from owner's substation to respective distribution boards (PDBs/ LDPs) and from distribution boards to the user points as per attached cable routing drawing no. B957-999-16-50-01010. Contractor shall use the owner's cable route wherever available; wherever owner's cable route is not available, complete cabling system including trench, cable trays etc. shall be in the scope of the Bidder.

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4.4 Bidder shall provide necessary outdoor located flameproof Power Distribution Boards (PDBs) and flameproof, Ex'd' type Load Distribution Panels (LDPs) for receiving & distributing power for the system.

4.5 Bidder shall supply & lay the cables between the owner's substation and PDB/ LDP, between PDB & LDP, and between the LDPs & heat tracing loads. Contractor shall also supply & lay the communication cables between controllers in LDP to central monitoring system in MCR.

The cable route shall be decided during detail Engineering based on the number and location of the Heat tracing panels. Any additional cable tray/ buried trench required for routing the Heat tracing / power cables / control cables/ FO/ CAT-6 cables shall be in the scope of the bidder. Refer Cable layout attached with the tender. It may be noted that this layout is for only estimation purpose any change in the cable route due to site constraint shall be taken care by Contractor without any time and cost implication to owner

5. AREA CLASSIFICATION

5.1 The plant area has mixed areas i.e., Safe Areas, Zone 1 & 2, Gas group IIA/IIB/IIC temperature class T3 areas, as shown in the area classification drawing attached elsewhere in the tender. All equipments, heat tracer and associated accessories/ components, LDPs, PDBs etc. related to electric heat tracing shall be suitable for minimum Zone-2, Gas Group IIA/IIB, Temp. Class T3 for areas indicated as Gas Group IIA/IIB in the area classification drawing. For areas which is indicated as Gas Group IIC (in the area classification layout), the complete heat tracing system shall be suitable for minimum Zone-2, Gas Group IIC, Temp. Class T3.

5.2 All equipments, heat tracer and associated accessories/ components, LDPs, PDBs etc. related to electric heat tracing shall be suitable for minimum Zone-2, Gas Group IIA/IIB/IIC, Temp. Class T3. Exact classification, gas group shall be as defined elsewhere.

5.3 The Power distribution boards (PDBs) / Load distribution panels (LDPs) shall be located at a suitable location as per site conditions and as per directions of engineer-in-charge/ EIL.

5.4 The Power distribution boards (PDBs) & Load distribution panels (LDPs) shall be flameproof type suitable for Zone-2, Temp class T3 irrespective of the area classification layout attached. PDBs & LDPs shall be suitable for Gas Group IIA/IIB or IIC as per area classification layout attached with tender.

5.5 The hazardous area equipment shall have test certificates issued by recognized independent test house (CIMFR/BASEEFA/LCIE/UL/FM or equivalent). All indigenous equipment shall conform to Indian standards and shall be certified by Indian testing agencies. All equipment (indigenous & imported) shall also have valid statutory approvals (CCOE/PESO). All indigenous flameproof equipment shall have valid BIS license and marking as required by statutory authorities.

6. ENGINEERING AND JOB SPECIFIC REQUIREMENTS

6.1 Various equipment (to be supplied by Contractor) covered in this Package, shall be in compliance with the requirements defined in equipment datasheets and specifications attached/referred. Besides these, the requirements as defined in respective clauses for individual equipment, referred elsewhere in this document shall also be considered/ complied with.

6.2 Contractor shall ensure that all electrical equipments shall comply with the site and system conditions, ratings and other technical requirement specified elsewhere with the documents attached with the package.

6.3 CONTRACTOR shall use this specification, datasheet and OWNER/ Consultant's standard specifications for various equipments. For equipments, where OWNER/Consultant standard specifications are not available, have not been attached, CONTRACTOR shall use their own specification, developed based on project specific requirement and good engineering practices prevalent in petroleum industry, so as to ensure satisfactory operation and maintenance conditions.

6.4 CONTRACTOR shall note that data sheets for some of the equipment are not enclosed separately. Equipment data sheets for such equipments shall be prepared by the CONTRACTOR based on relevant codes and specifications and the data sheet shall contain all technical data and information which is essential for the purpose of review and technical acceptability, detailed engineering, installation, testing, repair and maintenance, replacement, etc. of the equipments.

6.5 All equipment shall be subjected to routine and acceptance tests as per applicable specifications

6.6 **Scope of Engineering:**

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i) Heat loss calculations & tracer selection

ii) Voltage drop calculations and sizing of all power and control cables

iii) Finalization of optimizing location of PDBs and LDPs considering Owner's substation & heat tracing loads.

iv) Calculations of no. of circuits and length of tracers required

v) Preparation of electrical single line diagram showing distribution and circuit-wise load details

vi) Scheme for connecting the controllers in LDPs to central monitoring system (by others)

vii) Preparation of cable schedules, earthing schedules of equipment

viii) Preparation of cable tray/ trench layout drawing

ix) Preparation of bill of materials for heat tracing, earthing and cabling.

x) Location of PDBs & LDPs in the unit battery limit

xi) Any other document for completion of heat tracing system

7. EQUIPMENT SIZING AND SELECTION CRITERIA

7.1 ELECTRICAL DESIGN BASIS

Details indicated in this specification and attached Engineering design basis, standard specification shall form the basis for basic design and developing detailed design and engineering for electrical heat tracing system.

7.2 EQUIPMENT SIZING

i) The fault level for various voltage levels of Electrical system for this complex shall be limited and provided as under. Accordingly, the associated electrical equipment shall be selected suitable for same: 50 kA (RMS) (1sec.) for 415V

8. SCOPE OF WORK

Bidder's scope shall include design, engineering, supply, installation, testing & commissioning of the complete electrical heat tracing system inclusive of trace heaters with all accessories e.g. End connectors, T-Connectors, Thermostats, splice connectors & junction boxes etc. as per EIL specification 6-51-0095 for pipelines / flanges / valves /instruments / impulse lines, supports, etc., as per the list of lines, list of equipments & other documents attached elsewhere in the MR. For the maintenance temperature, operating temperature, design temperature, steam flush out temperature, insulation thickness and other technical particulars required for the heat tracing design calculations, refer other documents enclosed elsewhere in the package.

- Design & engineering of the complete electric heat tracing system described in this document and package shall be done by "Heat Tracers" vendor.
- Supervision of installation, testing & commissioning of the complete electric heat tracing system shall be done by "Heat Tracers" vendor.

8.1 Scope of Supply

Bidder shall supply all items / equipment required for completion of work except those specifically mentioned in Cl. 8.4 below. The equipment and materials in Bidder's scope shall include but not be limited to the following:

i) Required quantity & rating of Outdoor flameproof & weatherproof Power distribution boards (PDB)/Load distribution panels (LDPs) with adequate no. of outgoing circuits for receiving 415V TPN incoming & distributing power to the electrical heat tracing system.

ii) Trace Heaters with all accessories e.g. End Connectors, T-Connectors, power connector, RTD, Multiple circuit temperature controllers, Junction boxes etc.

iii) Central monitoring system with server, HMI at petchem MCR. All hardware including interconnecting cables along with furniture for HMI shall be in scope of the contractor.

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iv) Based on location of LDPs and MCR, complete communication cables (FO/ Cat-6 cable), HDPE duct, connectors, end terminations kits and cabling system etc.

v) 1.1 kV Cu/Al conductor, XLPE insulated, FRLS Power & Control Cables from Substation to PDB/ LDP, PDB to LDP and from LDP to the user points as required. Control cables shall be XLPE insulated, twisted pair individual & overall shielded type, with 2.5mm2 copper conductor.

vi) Double compression Nickel plated brass cable glands & crimp type heavy duty tinned copper lugs.

vii) Flameproof & weatherproof Junction box for heat tracing system, as required.

viii) Cable trays (on pipe racks/ sleepers where customer cable routes are not available) and tray covers including cable tray supports/foundations and RCC cable trenches/ trenching work (wherever required.

ix) Cable identification tags, GI saddles, saddle bars and associated accessories.

x) Complete materials for earthing such as GI earthing strip, wire ropes & earth plates etc. If PDB/LDP is located in a location where plant main earthing grid is not available, 2 nos. earth electrodes shall be provided for PDB earthing as per EIL standard 7-51-0102. Earth connection to be extended to all power JBs installed in the field.

xi) GI pipes, structural steel, MS frames, supports, canopies, brackets, anchor fasteners etc.

xii) Miscellaneous material for civil works such as sand, bricks, cement, sheets, etc.

xiii) Any other material (not covered under Owner's supply at Cl.8.5) and though not specifically mentioned above but required for completion of the work as per specifications, drawings and instruction of Engineer-in-charge.

8.2 **Installation Testing & Commissioning**

Installation, connection, testing and commissioning of all equipment and materials connected with Heat Tracing system supplied by Bidder and free issued by Owner are included in the scope of this package.

8.3 **Other Miscellaneous works**

Other Miscellaneous works in Bidder's scope includes the following:

i) For cable laying in owner’s trenches, contractor’s scope may also include opening of trenches & making good the same after cable laying. If the same is not possible, contractor shall make new trenches for cable laying. New ERCs as required for Contractors cables shall be made by contractor.

ii) Repairing of all civil works damaged during installation of electrical facilities and civil works connected with installation, testing & commissioning of the heat tracing system.

iii) Scope of work under this contract shall be inclusive of civil works necessary for the installation of equipment, materials and making good of the same after completion of work including foundation for outdoor located PDB/LDPs etc.

iv) Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation / drawings from Central Electricity Authority.

v) Supply and installation of all other accessories including structural works not specifically mentioned herein but nevertheless necessary for completion of job.

vi) Engineering and preparation of specifications and drawings for electrical equipment and installation required by the owner for approval.

vii) Preparation of field testing & commissioning procedure as required.

viii) The scope shall also include handling, transportation of equipment/ material from stores/ warehouse to the place of installation and supply of commissioning spares wherever required.

8.4 Co-ordination with other contractors/agencies

It is the responsibility of the contractor to co-ordinate & provide all necessary assistance to other contractors/agencies involved in the complex for proper & timely execution of the works

8.5 **Supply by Owner**

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The following items shall be in owner's scope of supply (Free Issue):

i) 415V feeders in Owner's substation.

ii) Owner's Cable trays in S/S, trays & RCC trenches as shown in cable layout drawings

iii) Plant main earthing grid as shown in earthing drawings

9. SPECIAL REQUIREMENTS

9.1 The equipments & system shall confirm to the attached EIL specifications & standards with modifications as per this specification.

9.2 The Heat tracing system shall also confirm to following Indian Standards & IEC.

IEC/IEEE 60079-30-1&2: : Explosive atmospheres - Electrical resistance trace heating

Part-1: General & testing requirements

Part-2: Application guide for design, installation and maintenance

9.3 The location, routing & details of lines/equipments/ instrument impulse line etc. to be electrically heat traced shall be as per other documents as attached elsewhere in the tender.

9.4 The maintenance temperature for electrically traced lines/ equipments shall be as indicated in other documents i.e. line list/equipment list attached elsewhere in tender. Ambient temperature as per site conditions mentioned above shall be considered for heat loss calculation & selection/ sizing of heat tracer.

9.5 The electrical heat tracers shall be low watt density, "Self Limiting Self Regulating" type conforming to BS-6351. Mineral insulated (MI) cables shall only be used if the required temperatures are beyond the capabilities of Self-regulating heaters, and shall only be used with the approval of the Owner/EIL.

9.6 The selection of electrical heat tracers and approach classification shall be as per EIL Standard Specification (6-51-0095). Double insulation technique as mentioned in Sr. no. 3.1.2 (f) of Specification 6-51-0095 shall not be utilized for any case.

9.7 Heat loss calculation, tracer selection calculations, design and engineering of the electrical heat tracing system shall be carried out by selected heat tracer supplier Parent / Indian subsidiary.

9.8 Special glands/precautions shall be taken for sealing the entry portions of heat tracer cables as per the tracer manufacturer recommendation.

9.9 PDBs / LDPs shall be installed outdoor unit area.

9.10 PDB / LDP shall be provided for receiving power from substation & distributing power to the User Points. The PDB shall have 1 no. TPN MCCB as Incomers and required no. of TPN outgoing MCCBs. The MCCB shall be complete with O/L, S/C & E/F protection. The LDP shall have 1 no. TPN MCCB (Short circuit, over load, earth fault releases) as incomer and DP MCB with RCCB and power contactor in the outgoing feeders. 3 Nos. ON type LED indicating lamps shall be provided for incomer & each outgoing feeder of the PDB / LDP.

All MCCBs shall be microprocessor based and shall be with shunt trip. Shunt trip shall be suitable for 240V AC. LOTO Facility shall be provided in PDB/LDP.

9.11 The PDB/ LDP shall have voltmeter & ammeter with selector switches at incomer.

9.12 The flameproof PDB shall generally confirm to EIL spec 6-51-0007 and the flameproof LDP shall generally confirm to EIL spec 6-51-0008.

9.13 The incoming cable size for PDBs / LDPs shall be worked out by Bidder and shall be subjected to review by owner/ EIL during detail engineering. The PDBs / LDPs shall be suitable for terminating finalized cable size. In case JBs are required for terminating of incoming cables, the same shall be provided along with the PDBs / LDPs by Bidder without any time and cost implication to owner.

9.14 The incoming cable for heat tracing power distribution panel shall be with four cores, the neutral conductor being of same size as the phase conductors

9.15 All outdoor equipments including PDB / LDPs shall be provided with FRP canopy.

9.16 Joints shall not be provided in power & control cables.

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9.17 All power cables upto 16 mm^2 shall have copper conductor and all cables equal to or above 25 mm^2 shall be with either Copper or Aluminum conductor. All control cables shall be of size 2.5 sq.mm. and shall have copper conductor and shall be twisted pair overall and individual shielded type. Multi stranded cable to be used instead of single strand. Recommended limiting size of multi core cable is 300 sq mm.

9.18 RTD input is required for control and monitoring purpose of Electrical Heat Tracing system.

9.19 Multi circuit temperature controllers (provided in LDP) shall have facility to connect required numbers of RTDs which shall be connected to Central monitoring system (supplied by others). Temperature controller shall have below monitoring and alarm facility as a minimum: -

i) Low Temperature Alarm

ii) High temperature Alarm

iii) Circuit on / off indication

iv) RTD or Sensor failure alarm

v) Ground fault alarm

vi) Current and temperature values

vii) Communications failure alarm

viii) Self-diagnostic feature (watchdog)

ix) Shall have communication capability through FO cable/Modbus TCP/IP

These are in addition to monitoring & alarm facility included in standard specification 6-51-0095.

9.20 Controllers shall be of selected Heat Tracer manufacturer make and sourced from the manufacturer country of origin. Controllers shall be connected preferably in ring topology to central monitoring system with server through FO/CAT-6 cable. All data available in LDPs shall be available at central monitoring system.

9.21 The HMI and servers shall be industrial type and supplied with latest configuration & latest version of Microsoft windows and all software provided shall be suitable for the same. Servers shall be capable for storage of more than 1 year data of all connected LDPs including 20% margin capacity.

9.22 HMI shall have provision for communicating all data to owner DCS on Modbus TCP/IP through FO cable.

9.23 Data mapping format for integration of complete data of central monitory system/ HMI with owner's DCS shall be provided to Heat Tracing Contractor post order and completely filled data mapping format shall be furnished by heat tracing Contractor detailed engineering. Any assistance and co-ordination with DCS Contractor/ other Bidder shall be provided by heat tracing Contractor.

9.24 FIBRE OPTIC CABLES

i) The fibre-optic cable shall be with a minimum of 2 spare fibres. Procedure of data transmission, error control and recovery shall be as per acceptable standards.

ii) All lengths shall be joint free single continuous lengths. Coating and the color of the fibre shall not react with the surrounding jelly. Outer sheath shall be flame retardant low smoke (FRLS) type of "Grey" colour.

iii) Fibre-optic data highway cable shall be suitable for water-submergence duty and high temperature withstand as per the routing requirements in the plant. All lengths shall be joint-free continuous lengths.

iv) Optical fibres shall be coated with UV cured double acrylate resin. It should not have any reaction with cladding or core material.

v) The coatings shall be in various colours in order to facilitate fibre identification. Fibre colours shall correspond to latest revision of IEC publication 60793-2 and 60304. The colours shall correspond reasonably with standard colours and shall readily be identifiable and shall be durable. The colours should have good colour fast properties also in the presence of other materials during the lifetime of cable. The coating and the colour shall not react with the surrounding jelly.

vi) The fibre optic cable shall be protected against damages from termite, rodent, fire, chemicals (such as oil & natural gas, LPG and other petroleum products), moisture and water over the life time of the cable.

vii) Moisture barrier – Polymer coated aluminium tape placed longitudinally over the cable core. The tape shall form a close fit around the cable core with a sealed overlap of 6mm minimum. The thickness of each

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polymer layer shall be 0.04 mm minimum. The thickness of fully annealed aluminium foil shall be 0.15 mm minimum.

viii) The armouring of the optical fibre cable shall be of corrugated steel (electrolytically chrome plated low carbon steel) tape both side coated with ethylene acrylic copolymer, applied longitudinally with minimum overlap of 6mm. The thickness of the steel tape shall be 0.15 mm minimum. The thickness of each polymer layer shall be minimum 0.04 mm minimum.

ix) The cable shall have sufficient strength to withstand a load of value T = 9.81×W newtons, where W = mass of 1 km in kg. The load shall not produce total strain exceeding 0.25% in the fibre.

x) The termination enclosures of the optical fibre cable should be dust tight (No dust ingress) and protected against immersion in water (suitable for continuous immersion in water) and should be complete with all accessories including splice cassettes splice protection and all other accessories including accessories for electrical continuity of metallic layers of optical fibre cable and OFC preparation kit along with instruction sheet.

xi) All fibres (including spare fibres) of a cable shall be terminated in the termination enclosure by pigtails. Subsequent connection shall be by patch chords. Supply and erection of termination enclosure, LIU, splices, pigtail, patch chord connection etc. is in vendor's scope. OTDR analysis/report shall form part of the testing activities of the OFC network.

xii) HDPE duct of "Grey colour" shall be supplied for fibre optic cable routing, shall be permanently solid lubricated/ with spiral groove, UV-protected, fire retardant (Class V2 as per UL-94 and with limited oxygen index of 21 or higher as per ASTM D2863), of 40 mm outer diameter (+5.0/-0.0 mm) minimum thickness 3.7 mm, suitable to withstand load of 6 kg/m2.

xiii) All HDPE ducts shall be supplied along with accessories such as push fit coupler, bend and elbow, end plug, simple plug, sonic head, etc. required for blowing cable into HDPE duct by compressed air technology.

xiv) Vendor shall furnish past track record for the selected make of the HDPE duct during drawing review stage. Make of HDPE duct shall be approved by Owner during drawing approval stage

9.25 Testing of cables & FLP Junction boxes shall be as per attached EIL Inspection Test plan 6- 81-1051, 6-81-1052 & 6-81-1061 respectively.

9.26 Supports for cable trays shall be provided at every 3000mm.

9.27 RCCB with 30mA rating shall be provided in outgoing single-phase circuits for human safety. Earth fault protection shall be provided in outgoing three phase circuits in PDB.

9.28 All TPN power cables for Electrical heat tracing loads shall be 4-Core of suitable size. 3 ½ core cable for TPN loads are not acceptable.

9.29 Refer clause 3.1.2 (g) of 6-510095, table for heat tracer selection stands revised as below:

Maintenance temperature	**Operating (Continuous power ON)**	**Exposure/ Intermittent**	**Tracer type**	**Approach**
		Power OFF		**(Product/ system)**
<=121	<=121	<=250	Self-Regulating	Product
From 121 to 150	From 121 to 150	<=250	Self-Regulating	Product/Stabilised (Refer c, d & e)
From 151 to 200	From 151 to 200	<=250	Self-Regulating / Power Limiting	Product/Stabilised (Refer c, d & e)
>200	>200	Any	Mineral Insulation/ constant wattage	Controlled

For controlled approach, redundant RTD shall be provided so as to ensure that T3 rating is complied even in case of failure of one RTD.

9.30 Refer Cl. No. 3.1.11 of EIL Spec. 6-51-0095 and note that maximum steam flushing temperature for periodic steam cleaning of piping & other equipment shall be considered (as per other documents attached with package) for intermittent exposure under power-off condition and offered electric heat tracer shall be suitable for the same.

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Contractor shall submit the approval from statutory authority from country of origin indicating the exposure temperature rating of offered tracer.

9.31 Heat tracers shall also be suitable for the complete operating temperature range mentioned in the line list.

9.32 Tracer shall be sized for -10% voltage drop upto tracer JB.

9.33 The PDB / LDP shall have IP-55 degree of protection for outdoor use having separate external enclosure and shall be provided with transparent glass / acrylic windows for viewing the meters & indicating lamps.

9.34 Refer to clause no. 3.1.14 of 6-51-0095, please note that RTD shall be provided for each circuit irrespective of the design load of the circuit.

9.35 Sizing of earthing strips shall be suitable for maximum fault current and for duration of 1 seconds. Maximum fault current shall be 65KA.

9.36 Bidder shall note that bill of material if any furnished with the offer will be retained for information and records only. All materials and components as required to meet package specifications and functional requirement shall be included in the Bidder's scope without any cost and time implication to the owner.

9.37 Bidder is informed that the detailed offers from the equipment manufacturer and assumptions/ clarifications for the electrical heat tracing system is not required to be furnished in the Bidder's proposal at bidding stage. If any such details are furnished by the Bidder in their proposal, these shall not be reviewed or taken cognizance of at the bidding stage. These details shall be treated as preliminary and for reference and record purpose only and shall not be contractually binding.

10. STATUTORY APPROVAL

10.1 The submission of application on behalf of the Owner to CEA or Electrical Inspector along with copies of required certificates complete in all respects shall be done by the contractor well ahead of time so that the actual commissioning of equipment and electrical system are not delayed for want of approval by the Inspector. The Contractor shall arrange the actual inspection of work by the Electrical Inspector and necessary coordination and liaison work in this respect shall be the responsibility of the contractor.

10.2 The Inspection and acceptance of the work as above shall not absolve the Contractor from any of his responsibilities under this contract.

10.3 Any other statutory approval of works required for the electrical installation is also included in the contractor's scope.

11. INSPECTION, TESTING AND COMMISSIONING

11.1 Site inspection, testing and commissioning of electrical installation shall be carried out as per relevant local standards & practices.

11.2 All the equipment installed by the Bidder shall be tested and commissioned.

12. DRAWING

12.1 Construction shall be carried out as per drawings/ specifications issued/ approved by the engineer-in-charge during the course of execution of work.

12.2 After the job completion, Bidder shall prepare 'AS-BUILT' drawings. Final certified 'AS- BUILT' drawings shall be submitted by the Bidder to owner in bound volumes & in soft copies/CDs.

12.3 Bidder shall submit equipment manufacturer's drawing for supply items for the review of Engineer-in-Charge and the approval in writing of the Engineer-in-Charge shall be obtained before commencing manufacture. However, it is to be understood that the review of drawings shall not absolve the basic responsibility of Bidder to check total compliance to specifications included in tender document.

13. TRAINING

13.1 Training for complete Heat Tracing system at site for Owner engineers for minimum 10 days shall be provided.

14. MAKES OF EQUIPMENT AND MATERIALS (refer elsewhere in the Package)

15. Spares

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15.1 Mandatory spares:

The following mandatory spares for electrical equipments shall be supplied by the contractor:

S. No.	Part Description	Quantity Required per equipment
1	RTD/Thermostat	1 No. of each Type
2	control fuses/ MCB	5 Nos. of each rating & type
3	Indicating lamps	10% or 2 nos. (min.) whichever is more
4	Indicating lamps covers	5 nos. of each colour
5	Contactor contacts	1 set for each rating and type

NOTES:

a. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.

b. Wherever % age is identified, Bidder shall supply next rounded figure.

c. The terminology used under 'Part Description' is the commonly used name of the part and may vary from manufacturer to manufacturer.

d. Mandatory spares as indicated above do not cover commissioning spares.

e. Mandatory spares as indicated above do not cover two year O&M spares.

15.2 Erection/Commissioning Spares**:**

All erection/commissioning spares shall be included by the Bidder in the quoted price. The list of such items shall be furnished along with the offer.

15.3 Two Years Operation & Maintenance Spares**:**

Bidder shall provide list of spares required for two years of normal operation and maintenance for all electrical equipment along with unit prices.

15.4 Special Tools and Tackles**:**

All required special tools and tackles shall be included by the Bidder in the quoted price. The list of such items shall be furnished along with the offer.

Signature Not Verified
Digitally signed by ARITRA DE
Date: 2026.05.18 17:37:36 IST
Location: eProcure EPROC

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