FORMAT NO. : HSE-22 REV 0

Hydraulic Mobile Crane- Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Identification number of Hydraulic Mobile crane boldly scribed in front and rear end of machine		
2	Operator has got adequate document in support of his competency (i.e. HMV driving license, knowledge & training)		
3	Marking of SWL on hook position is clearly visible		
4	Test & examination of Hydraulic Mobile crane by statutory / competent authority is carried out & document is valid		
5	Colour Coding		
6	RC Document		
7	Fitness Certificate of Vehicle by authority		
8	Valid Insurance		
9	Valid PUC		
10	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
11	Safety Induction for Operator		
12	Crane hooks have got smooth surface and no dent		
13	Hook-latch / Dog-clamp in hook is effective		
14	Over hoist limit switch		
15	Over Load Indicator		
16	SLI		
17	Condition of boom		
18	Condition of wire rope		
19	Rope drum / sheaves are in good working condition		
20	Leakage in hydraulic cylinder		
21	Tyre condition		

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22	Battery		
23	Moving & rotating parts guarded		
24	Break		
25	Parking Break		
26	Front horn		
27	Reverse horn		
28	Hydraulic Mobile Crane cabin body and frame of machine is in good order		
29	Both side Mirror		
30	Fire Extinguisher		
31	Front glass pane of the Hydraulic Mobile operator's cabin is clean & clear (i.e. not cracked / damaged / broken)		
32	Windshield and wipers condition		
33	Working of front & back lights, turn Indicators, parking lights & fog lamps		
34	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		
35	Wheel chokes are present and are used whenever required		
36	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
37	Others		

Signature & Name of Operator

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-23 REV 0

Hydraulic Rig Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
2	All switch & mechanical guards are in good condition and properly installed		
3	All Safety Indicator lights work		
4	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
5	Motion alarms are functional		
6	Safety decals are in place and readable		
7	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
8	Braking devices are operating properly		
9	Winches, pulleys and wire ropes are in good working condition.		
10	Function of interlocks and limit switch		
11	The manufacturer's operations manual (in all languages of the operators)		
12	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
13	Battery Charge		
14	Outriggers in place or functioning. Associated alarms working		
15	Moving & rotating parts guarded		

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16	Load chart provided		
17	Fire Extinguisher		
18	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
19	Serial number plate		
20	SLI		
21	TPI Certificate		
22	Colour Coding		
23	Insurance		
24	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
25	Safety Induction for Operator		
26	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-24 REV 0

Boom Lift Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Operating and emergency controls are in proper working condition, EMO button or Emergency Stop Device		
2	Functional upper drive control interlock (i.e. foot pedal, spring lock, or two hand controls)		
3	Emergency Lowering function operates properly		
4	Lower operating controls successfully override the upper controls		
5	Both upper and lower controls are adequately protected from inadvertent operation.		
6	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
7	All switch & mechanical guards are in good condition and properly installed		
8	All Safety Indicator lights work		
9	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
10	Motion alarms are functional		
11	Safety decals are in place and readable		
12	Guardrails and anchor points are in place, and in good condition		
13	Work platform & extension slides are clean, dry, & clear of debris		
14	Work platform extension slides in and out freely with safety locking pins in place to lock setting on models with extension platforms.		
15	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
16	Braking devices are operating properly		
17	The manufacturer's operations manual is stored on AWP (in all languages of the operators)		
18	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		

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19	Battery Charge		
20	Outriggers in place or functioning. Associated alarms working		
21	Tyres and wheels are in good condition, with adequate air pressure if pneumatic		
22	Wheel chokes are present and are used whenever required		
23	Moving & rotating parts guarded		
24	Load chart provided		
25	Fire Extinguisher		
26	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
27	Serial number plate with Load capacity		
28	TPI Certificate		
29	Colour Coding		
30	Insurance		
31	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
32	Safety Induction for Operator		
33	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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ANNEXURE-XV TO SPECIAL CONDITIONS OF CONTRACT

1) OISD 192
2) OISD 206
3) OISD 207

OIL INDUSTRY SAFETY DIRECTORATE

निर्माण के दौरान सुरक्षा प्रथाएं
ओ आई एस डी–जी डी एन- 192

SAFETY PRACTICES DURING CONSTRUCTION
OISD-GDN-192

ENGINEERS INDIA LIMITED

Inception	August 2000
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FOR RESTRICTED CIRULATION ONLY

OIL INDUSTRY SAFETY DIRECTORATE
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Ministry of Petroleum & Natural Gas
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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 by 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 three decades 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

The Oil Industry in India is over 100 years old. As such, various practices have been in vogue because of collaboration/ association with different foreign companies and governments. Standardization in design philosophies, operating and maintenance practices remained a grey area. This coupled with feedback from some serious accidents that occurred in the past in India and abroad, emphasized the need for the industry to review the existing state-of-the-art in designing, operating and maintaining of Oil and Gas installations.

With this in view, the Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardizing and upgrading the existing standards to ensure safe operations. Accordingly, OISD constituted a number of functional committees of experts nominated from the industry to draw up standards and guidelines on various subjects.

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 figures and photographs used in the document, if any, are representative in nature.

We, at OISD, are confident that the provisions of this standard, when implemented in totality, would go a long way in ensuring safe operation of the target group of locations.

Needless to mention, this standard, as always would be reviewed based on field level experience, incident analysis and environment scanning. Suggestions from all stake holders may be forwarded to OISD.

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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 expressly disclaims any liability or responsibility for loss or damage resulting from their use.

These documents are intended only to supplement and not to replace the prevailing statutory requirements of PESO, DGMS, Factory Inspectorate or any other Government body which must be followed as applicable.

Wherever Acts/ Rules/ Regulation and National/ International Standards are mentioned in the standard, the same relates to in-vogue version of such documents.

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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
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Sankar Raman V	CM-E&C, BPCL - Kochi Refineries Ltd.	Member
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In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this Guideline.

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SAFETY PRACTICES DURING CONSTRUCTION

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3. Shri P.K. Anand	ONGC, Mumbai.
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CONTENTS

SECTION		Page No.
1.0	**Introduction**	**1**
2.0	**Scope**	**1**
3.0	**Definitions**	**1**
4.0	**General Duties**	**2**
4.1	General Duties Of Execution Agencies	2
4.2	General Duties Of Owners	4
5.0	**Safety Practices At Work Places**	**4**
5.1	General Provisions	4
5.2	Means Of Access And Egress	5
5.3	Housekeeping	5
5.4	Precautions against The Fall Of Materials and Persons and Collapse Of Structures	6
5.5	Prevention Of Unauthorised Entry	6
5.6	Fire Prevention And Fire Fighting	6
5.7	Lighting	7
5.8	Plant, Machinery, Equipment and Hand Tools	7
6.0	**Construction Activities**	**9**
6.1	Excavation	10
6.2	Scaffolding, Platforms & Ladders	12
6.3	Structural Work, Laying of Reinforcement & Concreting	22
6.4	Road Work	26
6.5	Cutting/Welding	27
6.6	Working in Confined Spaces	29
6.7	Proof / Pressure Testing	31
6.8	Working at Heights	31
6.9	Handling and Lifting Equipment	34

ENGINEERS INDIA LIMITED

6.10	Vehicle Movement	39
6.11	Electrical	40
6.12	Offshore	43
6.13	Demolition	48
6.14	Radiography	49
6.15	Sand/Shot Blasting / Spray Painting	50
6.16	Work above Water	51

7.0 Additional Safety Precaution for Units with Hydrocarbons 52

8.0 Environment Protection 53

9.0 Occupational Health 55

10.0 Documentation 56

11.0 Safety Awareness & Training 56

12.0 References 57

Annexure I 58

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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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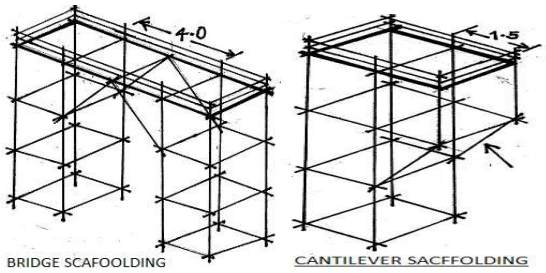

For all such cases, but not limited to, in addition to checklist, a plant specific procedure cum checklist based on additional risk is to be prepared & validated by a competent person (example: procedure for erection/ dismantling shall be prepared and followed. If need felt, help from Engineering Cell/Third 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.

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- 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.

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

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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.
- 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.

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- 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.
- 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.

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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.

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.

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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.

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

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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.

(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.

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

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 appliance. 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 atmospheric conditions;
(c) racks are designed and secured on firm ground so that units cannot move accidentally.

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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:

(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.

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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.

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.

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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 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

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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.

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.

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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.

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.

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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

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.

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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.

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.

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

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

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.

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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.

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;

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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;
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.

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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.

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.

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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.

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.

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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.

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.

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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

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

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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.

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.

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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.

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.

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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.

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.

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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.

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.

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6.11.2 Inspection and maintenance

i) All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.

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

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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.

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.

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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.

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.

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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 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.

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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.

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.

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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.

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.

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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.

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.

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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.

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.

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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.

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;

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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.

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;

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(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 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.

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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: -

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.

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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.

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

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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

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:

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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).

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.*

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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)*

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.

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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.

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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OIL INDUSTRY SAFETY DIRECTORATE

ऑयल एवं गैस उद्योग में सुरक्षा प्रबंधन हेतु दिशा-निर्देश
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GUIDELINES ON SAFETY MANAGEMENT SYSTEM IN OIL AND GAS INDUSTRY

OISD-GDN-206

ENGINEERS INDIA LIMITED

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FOR RESTRICTED CIRULATION ONLY

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PREFACE

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 return of these national assets and resources including sustainability.

To ensure proper implementation of the various aspects of safety in the oil & gas industry, the Government of India, vide Resolution No. R-13013/4/84-OR-1 dated 10th January, 1986 set up a Safety Council at the apex, under the administrative control of the Ministry of Petroleum & Natural Gas (MoP&NG). To assist the Safety Council, a technical directorate, namely the Oil Industry Safety Directorate (OISD) under the aegis of MoP&NG, has been entrusted with the responsibility of formulating standards, overseeing its implementation through safety audits to enhance safety level in the oil & gas industry.

OISD has developed a rigorous, multi-layer, iterative and participative approach for development of standards. OISD develops and revises Standards, Guidelines & Recommended Practices for the oil and gas sector through a participative process involving all the stakeholders (including the public at large), drawing inputs from international standards and adapting them to Indian conditions by leveraging the experience of the constituents. These standards cover inbuilt design safety, asset integrity and best operating practices in the field of production, processing, storage and transport of petroleum.

The participative process followed in standard formulation has resulted in excellent level of compliance by the industry. 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/ reference in various statutory rules and regulations of the land.

OISD and industry together strive to achieve nil incident in the entire hydrocarbon value chain. We at OISD, are confident that the provisions of this standard, when implemented in totality, would go a long way in ensuring safe operation in the oil and gas industry.

Executive Director
Oil Industry Safety Directorate

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NOTE

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OISD standards are published to facilitate sound engineering, operating practices and aimed to supplement the information to the oil and gas industry, however this may be used by anyone desiring to do so and are not intended to obviate the need for applying sound engineering judgement regarding when and where these standards should be utilized. The formulation and publication of OISD standard is not intended in any way to inhibit anyone from using any other practices and not to replace the prevailing statutory requirements, which must be followed as applicable.

Wherever Acts/ Rules/ Regulation and National/ International Standards are mentioned in the standard, the same relates to in-vogue version of such documents. Whenever there is any difference between the statutory norm and OISD standard, more stringent requirement should be followed. However, in case of any difference in the requirement between OISD standards, the requirement as specified in the standard released at a later stage shall prevail.

The industry has to carry out gap analysis and make necessary changes in their system in line with the revised standard and the requirement should be implemented within a time frame of 1 year (from the date of release of revised standard).

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

The standards would be reviewed periodically based on the decision in the Steering Committee/ Safety Council, industry request, technological development, recommendations of high level committee and accident investigation reports. Generally, OISD standards are reviewed and revised, reaffirmed or withdrawn at least every ten years.

Suggestions for revision are invited from the oil and gas industry and should be submitted to OISD at **ps-ed.oisd@gov.in**.

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M M Prasad	Additional Director	OISD, Noida (effective 03.05.2022)

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OISD sincerely acknowledge the valuable contributions made by industry veterans Sh. S L Chakravorty, Sh. S P Garg and Sh. Badal Roy by providing their technical & professional guidance for revision of this guideline. OISD also recognize the support & cooperation of several other experts from industry, who contributed to the preparation, review and finalization of this document.

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[2] Sh. Devendra M Mahajan joined IOCL on 03.05.2022 as Chief Manager (HSE)

GUIDELINES ON SAFETY MANAGEMENT SYSTEM IN OIL & GAS INDUSTRY

INDEX

S. No.	Content	Page No.
1.0	Introduction	1
2.0	Scope	1
3.0	Definitions	1
4.0	Safety Management System	5
5.0	Commit	6
5.1	Safety Organization	6
5.2	Consultation & Participation	10
6.0	Assess	10
6.1	Hazard identification and Risk Analysis (HIRA)	10
7.0	Control	16
7.1	Process Safety Information	16
7.2	Operating Procedures	18
7.3	Safe Work Practices and Work Permits	21
7.4	Training and Competence	22
7.5	Contractor Management	25
7.6	Safe Operation Management	28
7.7	Asset Integrity Management (AIM)	32
7.8	Management of Change	37
7.9	Incident Reporting, Investigation Analysis and Learning	37
7.10	Emergency Response Management	40
7.11	Transport Safety Management	40
7.12	Project HSE Management	42
8.0	Verify	44
8.1	Pre-Startup Safety Review	44
8.2	Safety Management System Audit	46
8.3	Management Review	49
9.0	References	50
10.0	Abbreviations	53
11.0	Annexures	
	Annexure 1: Definition of major accident as per DMP 2021, GOI, MoPNG	56

ENGINEERS INDIA LIMITED

	Annexure 2: Detail description of commonly used techniques to aid in hazard identification and qualitative analysis (Informative)	57
	Annexure 3: Detailed Steps of QRA, Individual and societal risk and ALARP level/ Tolerable risk limit values	61
	Annexure 4: General document control features	64
	Annexure 5: Typical contents of an operating manual of a process installation (Informative)	65
	Annexure 6 Critical activities which may be supplemented by safe work practices and work permits	68
	Annexure 7: Specimen template for declaration by contract employer (contractor)	69
	Annexure 8: Key elements of Bridging Document	70
	Annexure 9: General Guidelines for developing Shift handover/ take over procedure and recording information in logs	72
	Annexure 10: A specimen Interlock bypass procedure and format	74
	Annexure 11: Specimen procedure for deferment of scheduled Maintenance, Inspection, Testing and Calibration	76
	Annexure 12: OISD Incident Classification and Reporting criterion	78
	Annexure 13: (a) List of sample questions which an Investigators should ask to witness (b) List of sample questions for identifying incident root causes (Informative)	79
	Annexure 14: United Nations (UN) international classification system / Code Number & Letters for important and popular chemicals (Informative)	83
	Annexure 15: Content of a typical project HSE plan (Informative)	86
	Annexure 16: Details PHSER objectives for various phases (Informative)	88
	Annexure 17: Typical checklist of Project HSE deliverable (Informative)	91
	Annexure 18: Specimen Performance Management Sheet (Informative)	94
	Annexure 19: Typical criterion/ performance standards/ parameters	104
	Annexure 20: Major changes in revised edition	107
	Annexure 21: List of previous functional committee(s)	110

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SAFETY MANAGEMENT SYSTEM IN OIL & GAS INDUSTRY

1.0 INTRODUCTION

An effective Safety Management System (SMS) should be in place to prevent incidents and mitigate their consequences including catastrophic events. This document emphasizes the application of management controls for dealing with the hazards and risks associated with oil and gas industry.

2.0 SCOPE

This document provides guidelines, which shall be applied to all upstream, midstream and downstream sectors of the oil and gas industry for development of Safety Management System.

3.0 DEFINITIONS

3.1 **As low as reasonably practicable (ALARP):** The concept that efforts to reduce risk should be continued until the incremental sacrifice (in terms of cost, time, effort, or other expenditure of resources) is grossly disproportionate to the incremental risk reduction achieved.

3.2 **Asset integrity:** Safety Management System (SMS) element involving work activities that help ensure that equipment is properly designed, installed, operated, inspected & maintained in accordance with specifications, and remains fit for purpose over its life cycle.

3.3 **Audit:** A systematic, independent and documented review to verify conformance with prescribed standards of care using a well-defined review process to ensure consistency and to allow the auditor to reach defensible conclusions.

3.4 **Checklist**: A list of items requiring verification of completion. Typically, a procedure format in which each critical step is marked off (or otherwise acknowledged/verified) as it is performed.

3.5 **Competence:** Competence is defined as a combination of knowledge, skills and behavior/attitudes used to improve performance; or as the state or quality of being adequately or well qualified, having the ability to perform a specific role.

3.6 **Authorized Person:** A person with required competency duly designated / authorized by the management to carry out a specified job.

3.7 **Consequence analysis:** Consequence analysis involves determining the effects of the events of interest in terms of their physical extent and their severity. Determining the physical extent usually involves calculating the maximum distances from the source at which people are affected.

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3.8 **Controlled Document:** A controlled document is a document that must undergo formal review, formal approval, controlled distribution, controlled modification and controlled storage and access. or, in other words, a controlled document is a document that goes through Document Control processes.

3.9 **Facility:** The physical location such as plant, pipeline, storage terminal, distribution center, office building etc. where processing, handling, storage, transportation and their associated activities are performed.

3.10 **Hazard**: Source, situation or act that have the potential for causing harm to people, property, environment or a combination of these.

3.11 **Hazard Identification and Risk Analysis (HIRA):** A is a collective term that encompasses all activities involved in identifying hazards and evaluating risk at facilities, throughout their life cycle, to make certain that risks to employees, the public, or the environment are consistently controlled within the organization's risk tolerance.

3.12 **Hi-Po (High Potential) Near miss:** The near miss that could in other circumstances, have realistically resulted in one or more fatalities.

3.13 **Human Factor:** Environmental, organizational and job factors, and human and individual characteristics which influence behavior at work in a way which can affect health and safety.

3.14 **HSE Policy:** HSE Policy is the organization's documented commitment to Safety, Health and Environment which defines HSE objectives and the accountabilities and responsibilities of its management and employees in regard to safety management.

3.15 **Incident[3]:** An unplanned event which had or could have resulted in–personal injury or damage to the plant property, community or environment.

3.16 **Job Safety Analysis (JSA)/ Job Hazard Analysis (JHA)**: It is a structured tool that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. Ideally, the safeguards are put in place against identified Hazard to ensure the job is executed safely.

3.17 **Integrity Operating Windows:** Integrity operating windows are established limits for process variables (parameters) that can affect the integrity of the equipment if the process operation deviates from the established limits for a predetermined length of time.

3.18 **Lagging indicator:** Outcome-oriented metrics, such as incident rates or other measures of past performance.

3.19 **Leading indicator:** The parameter which indicates degree of implementation or conformance to policies and procedures that support the Safety management system.

3.20 **Line Breaking:** Line breaking means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

[3] *Incident includes accident and near miss.*

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3.21 **Lost Time (Man-days):** The total number of days for which the injured person (including contract workmen) was temporarily disabled till he/ she resumes duty/ and/ or certified fit by qualified medical practitioner. The day on which the injury occurred or the day the injured person returned to work are not to be included. However, all intervening calendar days (including Sundays or days off or days of unit/ installation shut down) are to be included. If after resumption of work, the person injured is again disabled for any period arising out of the injury which caused his/ her earlier disablement, the period of such subsequent disablement is also to be included in the lost time.

Note: Lost time accident should be monitored till the injured person joins duty. In case the injured person is yet to join the duty, then the status of report submitted will be preliminary. Final report against the same incident should be sent once the person joins duty and the man-days lost are known.

In case the injured person has been transferred to any other job (other than one, he was performing on the day of incident) and/ or removed from the job, the lost time man-days should be counted till he/ she is certified fit by qualified medical practitioner or 180 man-days whichever is minimum.

3.22 **Major Accident:** As per latest DMP of MoPNG/ OISD. Definition of major accident as per DMP 2021, GoI, MoPNG is attached as Annexure 1.

3.23 **Management Review:** It is a routine evaluation of whether the safety management systems are performing as intended to produce the desired results as efficiently as possible. It is the ongoing “due diligence” review by management that fills the gap between day-to-day work activities and periodic formal audits.

3.24 **Near-miss**: Any incident which does not result in any injury or damage to property but has the potential to result in injury and/or property damage.

3.25 **Non-routine:** A ‘non-routine’ job is any task that is not described in established procedures and that must be controlled to reduce the risks to acceptable levels. The work permit is required for non-routine jobs like construction, inspection, repair and maintenance work, entry into confined spaces, work at height, excavation, pressure testing of pipelines etc.

Non-routine jobs for which the work permit system is applicable shall be defined by the organization.

3.26 **Probability:** The likelihood of occurrence of an event or a sequence of events during an interval of time. By definition, probability is a number ranging from 0 to 1.

3.27 **Process:** Any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or on the site movement of such chemicals, or combination of these activities.

3.28 **Process Hazard Analysis:** Hazard Identification and Risk Analysis (HIRA) (3.12)

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3.29 **Process Safety Event:** A Process Safety Event occurred if

a) It leads to injury or fatality, a community or site evacuation.

b) A pressure relief device discharge or material release occurs which exceeded defined thresholds (even if none of the consequences above occurred).

3.30 **Pre-Startup Safety Review (PSSR)**: A technical review and inspection of equipment modification prior to startup to ensure that the modification has been installed in accordance with the approved design standards, that procedures are in place and adequate, and that training of affected personnel has been completed.

3.31 **Quantitative Risk Assessment (QRA):** A formal and systematic approach to estimate the likelihood and consequence(s) of hazardous events, and expressing the results quantitatively as risk to people, environment or business.

3.32 **Quality and Cost Based Sourcing (QCBS):** Quality and Cost Based sourcing means a system of bid evaluation where weightages are assigned to technical and financial criteria. The evaluation is made on the basis of combining the weighted scores for technical and financial criteria.

3.33 **Risk:** Combination of the likelihood of occurrence of a work-related hazardous event(s) or exposure(s) and the severity of injury and ill health that can be caused by the event(s) or exposure(s).

3.34 **Risk Tolerance Criteria:** A qualitative or quantitative expression of the level of risk that an individual or organization is willing to assume in return for the benefits obtained from the associated activity.

3.35 **Root Cause Analysis (RCA):** A formal investigation method that attempts to identify and address the management system failures that led to an incident. These root causes often are the causes, or potential causes, of other seemingly unrelated incidents.

3.36 **Safety Barriers:** Safety barriers are defined as physical and/or non-physical means planned to prevent, control, or mitigate undesired events or accidents.

3.37 **Safety Critical Equipment:** Safety Critical Equipment are the equipment, instrumentation, controls, or systems (including computer software) etc. whose malfunction or failure would cause or contribute substantially to a major incident or whose proper operation is required to mitigate the consequences of a major incident.

3.38 **Standard Operating Procedures (SOP):** A Standard Operating Procedure (SOP) is a document that consists of a set of instructions or steps on how to execute a task.

3.39 **Safe Operating Limit (SOL):** A value for a critical operating parameter (e.g., low/high pressure, level, temperature, pH, composition, and flow) that defines the equipment or process unit safe operating envelope beyond which a process will not intentionally be operated due to the risk of imminent catastrophic equipment failure or loss of containment.

3.40 **Safe Work Practices:** An integrated set of policies, procedures, permits, and other systems that are designed to manage risks associated with non-routine activities such as performing hot work, opening process vessels or lines, entering a confined space etc.

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3.41 **Shall:** 'Shall' indicates mandatory requirement.

3.42 **Should:** 'Should' indicates that the provision is recommended as a good engineering practice.

3.43 **Standing instruction/ orders:** Standing instructions are the pre-defined set of instructions which are applicable for a particular situation and helpful for operating personnel to tackle particular/ emergency situation effectively in time.

3.44 **Toolbox Talk (TBT): A meeting held with a work cr**ew, typically at the start of the work execution, during which safeguards required and provided, situation factors and human factors which can impact safety of the people during and after work execution and other related items are discussed

3.45 **Training**: Practical instruction in job and task requirements and methods. Training may be provided in a classroom or at the workplace, and its objective is to enable the workforce to meet some minimum initial performance standards, to maintain their proficiency.

3.46 **Unsafe Act -** Performance of a task or other activity that is conducted in a manner that may threaten the health and/or safety of workers.

3.47 **Unsafe Condition -** A condition in the work place that is likely to cause property damage or injury.

3.48 **Workforce**: A general term used to refer to employees and contractors at a facility. This term is often, but not exclusively, used to refer to operators, maintenance employees, and other employees or contractors who are not in a supervisory or technical role.

4.0 SAFETY MANAGEMENT SYSTEM

Safety Management System is the formal, top-down as well as bottom-up organization-wide approach to manage safety risk and assure the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk.

The organization should establish, implement, maintain and continually improve a safety management system. Safety Management System should be built on following four foundational blocks:

a. **Commit (to Safety)**

b. **Assess (Hazards & Risk)**

c. **Control (Risk)**

d. **Verify (for Assurance)**

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The elements of Safety management systems under each foundational block are as follows:

Commit

i. Safety Organisation

ii. Consultation & Participation

Assess

i. Hazard identification and Risk Analysis (HIRA)

Control

i. Process Safety Information

ii. Operating Procedures

iii. Safe Work Practices and Work Permits

iv. Training and Competence

v. Contractor Management

vi. Safe Operation Management

vii. Asset Integrity Management (AIM)

viii. Management of Change

ix. Incident Reporting, Investigation Analysis and Learning

x. Emergency Response Management

xi. Transport Safety Management

xii. Project HSE Management

Verify

i. Pre-Startup Safety Review

ii. Safety Management System Audit

iii. Management Review

5.0 COMMIT

5.1 SAFETY ORGANIZATION

Safety organization is the structure and process by which workforce in the organization are assigned specific functions, authority and responsibility for the accomplishment of organizational safety objectives and targets. The organization should determine the aspects that are relevant to its purpose and that affect its ability to achieve the intended outcome(s) of its Safety Management System. The identified aspects should include:

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5.1.1 LEADERSHIP AND COMMITMENT

Organization's leadership should provide strong, visible leadership and commitment and ensure that this commitment is translated into the necessary resources, to develop, operate and maintain the Safety Management System (SMS) towards strategic objective.

It should demonstrate leadership and commitment by taking overall responsibility and accountability for:

(a) Development of organization's HSE Policy and organizational structure that define competencies, responsibilities, authorities, and lines of communication required to implement the same

(b) Establishment of the Safety Management System.

(c) Ensuring that the Safety Management System is well integrated into the organizations' business processes.

(d) Encouraging engagement and safety leadership at all levels of the organization.

(e) Prevention of injury, ill health and providing safe and healthy work places and processes.

(f) Implementation of tools for preventing incidents in the organization. e.g. Risk Analysis, Safety Trainings, Safety Audits/ Inspections, Systems, Standards and Procedures, etc.

(g) Providing necessary resources (appropriate funding/ budget, competent and adequate human resources, technology support etc.).

(h) Ensuring periodic review of the Safety Management System (SMS) to determine if it continues to be suitable, adequate and effective.

(i) Promoting a positive safety culture and ensuring its periodical assessment

(j) Supporting and functioning of Safety Committee(s)

(k) Promoting all interested parties for reporting of unsafe acts, unsafe conditions and near misses.

(l) Ensuring emergency preparedness

5.1.2 HEALTH SAFETY AND ENVIRONMENT POLICY

(a) Every organization should establish, implement and maintain a Health, Safety and Environment (HSE) Policy duly approved by the Board. HSE policy should cover but not limited to

i. A commitment to provide safe and healthy working conditions for the prevention of work-related injury and ill health

ii. A framework for setting up of the Health, Safety & Environment objectives;

iii. A commitment to fulfil legal, statutory and other requirements;

iv. A commitment to eliminate hazards and reduce HSE risks;

v. A commitment to continual improvement of the Safety Management System;

vi. A commitment to consultation and participation of workforce.

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vii. A commitment to training on health and safety procedures to workforce

viii. A commitment to environment friendly

(b) HSE policy should be made available to all workforce in a vernacular language easily understood by them, displayed at various locations in the organization and revised as and when required.

(c) Organizational set-up for implementation, monitoring, review and update of HSE policy should be in place. The review & updation should be done at least once in 3 years.

(d) All the workforce of the contractor at the installation has to follow the policy of the Corporation.

(e) The organization should establish, pursue and monitor measurable HSE objectives and targets in the organization consistent with the HSE policy in order to maintain and continually improve the Safety Management System and safety performance.

Note: It is best practice to map HSE performance related KPI to annual performance appraisal system of employees.

5.1.3 SAFETY COMMITTEE(S)

(a) The organization should constitute the Safety Committee(s) at all levels including all relevant functions. The Committees should encourage consultation and participation of the workforce in their activities.

(b) Safety committee meeting should be held at a specified frequency and Minutes of the Meetings (MOM) should be recorded.

(c) The committee should review the compliance of MOM of previous meeting(s). Deliberations and monitoring of HSE performance, findings of audits, unsafe acts, unsafe conditions, near misses, off the job and on the job incidents, shortcoming in fire/ emergency drills, incident investigation/ analysis reports / recommendations, long pending safety concerns, escalation of concerns (if required) should be a part of agenda of safety meetings.

(d) For implementation of safety committee(s) recommendations, a time bound programme should be enforced.

5.1.4 SAFETY CULTURE

(a) Culture is attitude, value and belief that underpin “the way we do things”. Safety culture has been a key organizational factor in the implementation of a healthy Safety Management System.

(b) Organizations should promote a positive safety culture throughout the organization, which is characterized by

i. Visible leadership and commitment.

ii. An adequate knowledge base.

iii. Personnel competency, training,

iv. Informed decision making.

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v. Information sharing in which lessons learned and best practices are developed and shared.

vi. People acknowledge their accountability and act on their individual responsibility for safety.

vii. People trust, use, and rely on the organization's processes for managing safety.

viii. Individuals report/ raise safety issues without fear of reprisal, supporting the implementation of a non-punitive safety reporting system.

ix. Individuals are empowered to stop operation in the event of deviation and unsafe act/ condition.

x. Decision makers promote continual safety improvement through timely action, when appropriate, and provide feedback to the reporters.

(c) Organizations should carry out a safety perception/ culture survey to assess safety awareness of employees & safety culture of the organization on a periodic basis (preferably once in five years). Based on the findings, measures should be taken to improve safety perception & the safety culture.

(d) Safety Promotion is a set of means; processes and procedures that are used to develop sustain and improve safety culture through awareness raising and changing behaviour. Organizations should organize various safety promotional activities such as:

i. Trainings

ii. Safety Newsletters;

iii. Communicating updates alerting employees of hazardous conditions

iv. Safety survey (to assess safety culture)

v. Sharing lessons learned, dissemination of incident information

vi. Status boards (such as Safety records etc.)

vii. Visual display (such as Safety precautions for critical operations at strategic locations, Safety posters and slogans, Do's and Don'ts at toxic chemicals handling/storage/operation areas, Safety Data Sheet (SDS), Labeling of chemicals etc.)

viii. Management/ employee interaction

ix. Awareness drive

x. Suggestion scheme

(e) Empowerment of workforce: Any member of the workforce at the installation, irrespective of seniority, position or department should be empowered to stop or shut down an on-going operation and unsafe act in the event of deviation from approved procedures, perception of danger or inability to understand the way forward.

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5.2 CONSULTATION AND PARTICIPATION

An effective Safety Management System requires an organization to engage the workforce in development, implementation and continual improvement of the Safety Management System.

Communication should be two-way between leadership and workforce across various sections.

The employee Consultation & Participation element should address

5.2.1 The mechanism, time, training, roles & responsibilities and resources required for ensuring & promoting active consultation and participation.

5.2.2 The various activities (but not limited to) in which consultation and participation should be encouraged are as follows :

(a) Development of HSE policy/ objectives

(b) Determining competence requirements, training needs & expectation, Job Safety Analysis (JSA), Tool Box Talk (TBT)

(c) Involvement in safety campaign activities such as fire service day, safety quiz/ competitions, housekeeping campaign etc.

(d) Safety observation visits, safety walk by organization's leadership, supervisors for addressing work force safety concerns

(e) Safety suggestion schemes/ idea fairs etc.

(f) Participation in Safety committee(s)

(g) Ensuring continual improvement

(h) Identifying hazards and assessing risks and opportunities

(i) Determining control measures and their effective implementation

5.2.3 Establishment of means and methods to keep workforce informed about relevant safety and health issues, Safety and health hazards of the job and work environment, Personal Protective Equipment (PPE), Lesson learnt from incidents.

5.2.4 Preparation and display of procedures and instructions in vernacular language, understood by work force.

5.2.5 The process for addressing the employee's safety concern and suggestions.

6.0 ASSESS

6.1 HAZARD IDENTIFICATION AND RISK ANALYSIS (HIRA)

Hazard Identification and Risk Analysis (HIRA) includes all activities involved in identifying hazards, understanding potential incident scenarios, identifying safeguards and evaluating risk to people, the environment, property and business. HIRA encompasses the entire spectrum of risk analysis, from qualitative to quantitative.

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HIRA and Process Hazard Analysis (PHA) are interchangeably used terms. Henceforth HIRA/ PHA are referred as HIRA in this document.

6.2 PURPOSE OF CONDUCTING HIRA STUDY

(a) The purpose of HIRA is to identify, evaluate, and reduce the likelihood and/ or minimize the consequences of uncontrolled releases and other safety or environmental incidents within the organization's risk tolerance criterion by recommending. appropriate prevention and/or mitigation measures

(b) Also, the HIRA process is a worthwhile continuous improvement tool, identifying operability concerns and opportunities for improvement.

6.3 BASIC STEPS OF HIRA

(a) **Hazard Identification:** Hazards, which are sources of potential harm, should be identified as the first step of HIRA. The hazards associated with all aspects of the installation should be identified and understood before moving to the second step of identifying the risks for analysis. The hazard identification process should be dynamic and ongoing to ensure that any new hazards are identified throughout different phases of the project (such as planning, design, construction, commissioning, operation including startup and shutdown, maintenance etc.) This step is critical in the context of the risk management since an overlooked hazard (hence, risk) cannot be further assessed and controlled

(b) **Risk Analysis:** Risk analysis consists of determining the consequences and their probabilities for each identified hazard, or risk event. The consequences and probabilities for each hazard are then combined to determine a level of risk. This process involves an assessment of

i. The frequency/probability of the hazard occurring and

ii. The consequence severity of the hazard.

This can be accomplished using following methods (as applicable),

i. Qualitative- in which frequency and severity are determined purely qualitatively.

ii. Semi-quantitative -in which frequency and severity are approximately quantified within ranges.

iii. Quantitative risk assessment (QRA) - in which full quantification occurs.

6.4 ORGANIZATION'S APPROACH FOR HIRA

(a) Organization should develop a written approach document clearly defining applicability and methodology/ techniques of HIRA (viz. qualitative, semi quantitative and/ or quantitative).

The HIRA of existing facilities should be performed as soon as possible if it does not exist. For new facilities, the final project safety report may serve as the baseline HIRA. Revalidation of the baseline HIRA shall be done within two years of start-up in the risk evaluation matrix while establishing priority.

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(b) The scope of each study should be well defined to ensure that all types of processes and activities are considered.

(c) The physical scope (units, areas, or activities subject to HIRA) with clearly defined boundaries.

(d) Preference of risk control measures, tolerance criterion and competency of personnel should be clearly defined.

(e) Frequency of periodically reviewing and revalidation

6.5 APPLICABILITY FOR HIRA

HIRA should be carried out if there is:

(a) A significant change or addition to the facility (Refer MOC element)

(b) Projects - HIRA is required for each Project stage.

(c) Recommendation of Incident Investigation

6.6 SCOPE OF HIRA STUDY

The Organization approach document for HIRA is the master document for finalizing the scope of HIRA for a particular installation or facility. The major heads (but not limited to) which should be included in the scope for the HIRA study are as follows:

(a) The process hazards.

(b) The identification of any previous incidents that had the potential for catastrophic consequences.

(c) Engineering and administrative controls applicable to the hazards and their interrelationships.

(d) Consequences of the failure of these controls.

(e) The broader considerations of facility siting.

(f) Human factors that apply to the effective application of safety barriers or controls.

(g) A qualitative and quantitative evaluation of the effect of control failure on the safety and health of site workforce.

6.7 HIRA TECHNIQUES

(a) Commonly used techniques to aid in hazard identification and qualitative/ semi qualitative analysis include the following:

i. What-If;

ii. Checklist;

iii. Hazard and Operability Study (HAZOP);

iv. Failure Mode and Effects Analysis (FMEA);

v. Fault Tree Analysis;

vi. Bow-tie analysis

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vii. Layer of Protection Analysis (LOPA)

viii. An appropriate equivalent methodology/ technique.

Refer Annexure 2: Detail description of commonly used techniques to aid in hazard identification and qualitative analysis (Informative).

(b) The Quantitative Risk Assessment (QRA) is generally preceded by a qualitative/ semi qualitative systematic identification of process hazards. It is a quantitative evaluation of expected risk from high potential incident scenarios. It examines both consequences and frequencies, and how they combine into an overall measure of risk. The QRA results may be used to make decisions, particularly when mitigation of risk is considered.

QRA should be carried out with one or more of the following objectives,

i. To demonstrate compliance with the legislation.

ii. When the outcome of qualitative studies is not adequate for decision making,

iii. To support decisions on risk mitigation including emergency preparedness for facilities.

iv. To assist in option selection at project phase for land-use planning, layout, selection of inherently safer technology etc.

v. To indicate whether risks are tolerable as compared to defined Risk tolerance criterion by legislation or the organization.

vi. Whenever major addition in installation or major change in the surrounding areas/ population, operating parameters, product grade takes place or recommended by incident investigation.

Refer Annexure 3: Detailed Steps of QRA, Individual and societal risk and ALARP level/ Tolerable risk limit values

(c) The selection of a HIRA methodology / technique depends on many factors. The HIRA methodology/ technique to be adopted should be the most appropriate to the

i. The age and maturity (e.g., is it a process that has been operated for a long period of time with little or no change, or is it a new process or one that has been changed frequently) of installation/ operations.

ii. The size and technical complexity of the installation

iii. The quality of available information

iv. Potential severity of the site's major accident/ hazards

Note1. All HIRA methodologies are subject to certain limitations. For example, the checklist methodology/ techniques works well when the process is very stable and few changes are made, but it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes and consequently they would not be evaluated.

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Note 2: Where there are several similar size gas facilities and no sour gas, a generic HIRA/ PHA is feasible as long as the variations of the individual sites are accounted for in the HIRA.

6.8 THE TEAM

The process hazard analysis should be performed by a multidisciplinary team with expertise in technology, engineering and process operations, and the team should include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific HIRA methodology/ technique being used. The following aspects should be considered while constituting such teams.

(a) The team members should be fully knowledgeable in the proper implementation of HIRA methodology/ technique that is to be used and should be impartial to the evaluation.

(b) The team should have appropriate/ adequate knowledge of the standards, codes, specifications, and regulations applicable to the process being studied.

(c) The PHA team can vary in size with varied operational and technical background.

(d) Team composition should be decided based on the intent and trigger for the HIRA study. Suggested list of functions are as follows

i. Study Team Leader

ii. Team Member (Process/ Technology)

iii. Team Member (Operations)

iv. Team Member (Project)

v. Team Member (Mechanical)

vi. Team Member (Instrument)

vii. Team Member (Electrical)

6.9 UPDATION & REVALIDATION

(a) The HIRA should be reviewed and updated/ revalidated every 5 years after baseline HIRA.

(b) In case of major incident occurrence or any major modifications in the unit that may deem the earlier HIRA invalid, the installation should carry out HAZOP study and QRA as per regulatory requirement.

The following inputs shall be used for HIRA validation. At the end of the review, if HIRA team concludes that the previous HIRA does not meet the requirements or if it is observed that there are significant changes required to existing HIRA, the team should recommend and conduct fresh HIRA using appropriate methodology/ technique.

However, existing HIRA can be modified or revalidated based on following inputs if there are no significant changes involved.

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(a) Review all modifications since the previous HIRA and determine if an additional analysis is needed.

(b) Review the site's accidents and near misses since the previous HIRA, as well as learnings from relevant external incidents (for example, from sites using similar processes or technology), in order to ensure that potential hazards are identified, as well as the adequacy of existing safety barriers

(c) Review of past responses to ensure that the closure process has been robust. Any recommendations or actions not closed out should be further reviewed to make sure that the recommendation is still valid in light of the current HIRA process

(d) Evaluate hazards involved during start-up, shutdown, maintenance, sampling, etc. in a process unit to help identify procedural or equipment deficiencies that could contribute to human error.

(e) The effect of any new or existing regulatory requirements/ new internal/ OISD standard or existing or new industry standard on the HIRA.

(f) Review the changes in the surroundings of the installation (such as any new highway, Hazardous industry, storage etc. if an additional analysis is needed.

6.10 ACTION TRACKING

All HIRA (including QRA) study recommendations

(a) Should be duly agreed, authenticated for implementation by site higher management and record of the same should be maintained.

Note: The site higher management/ occupier of the site and the agency which has conducted the HIRA study should be duly agreed and sign a joint document endorsing the outcome and obligations of HIRA.

(b) Should be tracked, implemented in a time bound manner.

(c) Should be incorporated in all relevant documents.

(d) Should not be delayed/ deferred/ rejected. In case of delayed/ deferred/ rejection, proper justification should be written and accordingly existing/ alternate safety barriers should be ensured in place to take care of consequence. This should have the approval of higher management. Records of the same should be maintained.

6.11 COMMUNICATION

The outcome of HIRA study should be communicated with all concerned.

(a) Communicate risks to potentially affected internal stakeholders such as the workforce.

(b) Inform external stakeholders including emergency management agencies, of the hazards and risks identified the recommendations for risk reduction, and the residual risks.

(c) Awareness programmes/ drills should be conducted for potentially affected nearby localities.

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7.0 CONTROL

7.1 PROCESS SAFETY INFORMATION

Process safety information (PSI) refers to the complete and accurate, written information collected for all technologies, operations and equipment involved in operation of the facilities. PSI is used as a basis for other SMS elements including HIRA, training, Operating Procedures, Mechanical Integrity, Management of Change, Emergency response management plans and Incident Investigation etc. Complete and accurate written information (detailed in following sections) should be compiled for the following categories:

(a) Process and other chemical Information

(b) Process technology

(c) Process equipment

(d) Process safety event

7.1.1 PROCESS AND OTHER CHEMICALS INFORMATION

(a) Process chemicals should include all raw material, intermediate/ finished product, byproduct, waste generated, catalyst and chemicals etc. Similarly, other chemicals should include maintenance/ inspection chemicals (e.g., special oils, lube oils, dyes, paints etc.), sanitization/ cleaning chemicals, laboratory chemical/ reagents, waste treatment chemicals, drilling scale inhibitors & additives etc. used in the installation.

(b) Data pertaining to process chemical hazards should help in assessing fire and explosion characteristics, reactive hazards, safety and health hazards to workforce, environment and the corrosion and erosion effects on the process equipment.

(c) A complete inventory of the process chemicals should be prepared.

(d) Based on the compatibility of chemicals, their storage should be planned.

(Note: For major Installations like Refinery, QC laboratories (of installations), Petrochemical Industries etc. where large numbers of chemicals are handled, periodic review should be done to identify incompatible chemicals and a comprehensive, updated Compatibility matrix of such chemicals should be developed and maintained

(e) For each chemical handled at the facility, a 16-point (M)SDS sheet should be maintained

Note: For minimum content of (M)SDS, Refer OISD-STD-114.

7.1.2 PROCESS TECHNOLOGY

(a) Process technology (as applicable) information should include the following:

i. Written process descriptions

ii. Process chemistry

iii. Design basis

(b) A simplified Process Flow Diagrams (PFD) or block flow diagram for very simple processes

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(c) Piping & Instrument Diagrams (P&IDs)

(d) Process data Sheets

(e) Process chemistry, including hazards related to credible undesired chemical reactions

(f) Material and energy balances

(g) Safe upper and lower limits for process parameters such as temperature, pressure, flow, or composition, and the likely consequence of deviation from safe limits.

(h) List of safety critical equipment and system

(i) Licensor's manual, Supervisory Operating Manual

(j) Description of Interlocks, control system logic in narrative format and/or simple figures, Cause and Effect diagrams, Instrument Specifications

(k) Detailed fire assessment study: The extent of the fireproofing around equipment and structures should be based strictly on the detailed fire assessment study and the same should be clearly indicated on layout and construction drawings.

(l) HIRA Reports

7.1.3 PROCESS EQUIPMENT

(a) Process equipment include columns, vessels, heat exchangers, reactors, furnaces, pumps and compressors, valves, piping, storage tanks, silos, spheres, bullets, boilers, pipelines etc. that contain process chemicals.

(b) Design data/Hazards of process equipment should be documented and should include the following:

i. Approved installation layout, Equipment layout, plot plans of underground utility and process piping

ii. Design specifications and calculations including emergency shutdown system, depressurization system, Relief system including flare system, blowdown philosophy, heating and cooling system and their design basis etc.as applicable.

iii. Codes, standards and industry accepted engineering practices used for design and fabrication as applicable.

iv. Mechanical data/ design basis, inspection reports for process equipment

v. Shop fabrication drawings, General Arrangement drawings, Isometric drawings, As-built drawings

vi. Piping and Material specifications

vii. Electrical data, including Single-Line Diagrams (SLD), Motor database, and grounding/ bonding drawings and Hazardous area classification

viii. Structural drawings and structural analysis records/ design basis information for fixed fire protection and firefighting systems.

ix. Original Equipment Manufacture's Manual

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x. For the existing equipment where the codes used for design are no longer in general use, the design and construction of such equipment should be revisited and ascertained that the equipment is still suitable for its intended use. Testing/inspection carried out for this purpose should be documented.

7.1.4 Updation of process safety information should be done as often as necessary or at predefined frequency (at least once in every three years) whichever is earlier. A record of such reviews and changes should be maintained.

7.1.5 Wherever the original process design information no longer exists, information should be developed in conjunction with hazard analysis in sufficient detail after thorough review and approval process.

7.1.6 Organization should develop a documented procedure for control of Process Safety Information. (Refer Informative Annexure 4: General document control features).

7.2 OPERATING PROCEDURES

Provision of clear, concise, accurate and unambiguous written operating procedures is the most effective measure to prevent, control and mitigate. In some cases, these are the only practical way of managing a particular risk.

An effective way to convey the operating procedural information is to develop a comprehensive operating manual that can be used both as a training document as well as reference in the field. Organizations should develop an operating manual specific to the operation/ installation.

7.2.1 OPERATING MANUAL

The purpose of an operating manual is not only to help the operation personnel to operate the installation safely, but also to ensure availability of all the details and procedures required for safe operation, troubleshooting, emergency handling and training of personnel in a single comprehensive document.

(a) Operating manuals should be a controlled document. It should readily be available and accessible to all concerned. (Refer Informative Annexure 4: General document control features).

(b) Operating parameters should be consistent with the process safety information.

Note: Original Equipment manufacture's (OEM) manual and process licensor manual are the base document for development of Operating manual.

(c) All concerned should understand it thoroughly and should be fully conversant with the operating manual.

(d) The Operating manuals should cover (but not limited to):

i. Introduction

ii. Design Basis

iii. Process Overview: A detailed Process description including process chemistry, diagrammatic process flow, desirable conditions, Hazards etc.

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iv. Auxiliary and utility systems

v. Equipment operation: List and operating details of all equipment

vi. Standard Operating Procedure containing specific instructions with responsibility matrix on what steps to be taken or followed while carrying out the following

- for routine/ normal activities/ operations
- Temporary, abnormal and emergency operations such as Pre commissioning, Commissioning, Startup, Temporary operation, Normal shut-down, Emergency operation and shut-down, Simultaneous operations etc.

Note: Standard Operating Procedures are part of Operating manual, may be documented as separate volume if required. Development and content of SOP detailed in the following section (4.5.4).

vii. Instrumentation and Control: Cause and effect diagram, testing requirement, Control Systems and Optimization

viii. Details of Safety system: Details of Fire protection/ fighting facilities, details of Safety Critical Equipment, Fire and Gas detection system and Operation, MCP details hazards of exposure of the chemicals being handled, Preventive methods and control measures adopted for exposure protection

ix. Equipment/plant handing over taking over

x. Standard Blind List

xi. Analytical Tests: Sampling, Laboratory Analysis and Quality Control: Recommended Methods and Frequency

xii. Drawings: Process Flow Diagrams, Piping and Instrument Diagrams etc.

Note: For the typical contents of an operating manual of a process installation (e.g., Refinery, Gas processing Plant, Petrochemical installations etc.). Refer Annexure 5 (Informative).

7.2.2 Training should be imparted to all concerned on operating procedures in accordance with Training and Competence element.

7.2.3 Operating manuals should be updated as often as necessary. Atleaset every three years, operating manuals should be reviewed, revised and approved.

7.2.4 STANDARD OPERATING PROCEDURES (SOP)

Standard Operating Procedures govern the operation related activities. A standard operating procedure, part of an operating manual, serves as a tool to ensure that activities are performed properly and follows operational, quality, environmental, and safety requirements.

(a) Organizations should prepare a duly approved list of activities covering all cross section of work for which Standard Operating Procedures (SOP) are required to be maintained.

(b) Based on the list, written operating procedures should be developed and established.

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(c) SOP should be prepared by area experts covering statutory and OISD standards requirements.

(d) Organizations should define the authorities for approving SOP at different levels.

(e) SOP should be consistent with the process safety information.

(f) Workforce should be mandated to adhere to the SOPs

(g) Procedure for downward communication of SOP should be documented and followed.

(h) It should be ensured that the task team clearly understands the SOP and associated risk with mitigations in place before starting the job.

(i) Work instructions/ Do's and Don'ts derived from SOP should contain all necessary information enabling operating crew to successfully perform the task. SOP displayed or Work instructions/ Do's and Don'ts should be duly authenticated.

(j) SOP should be a controlled document (Refer Informative Annexure 4: General document control features).

(k) While developing a SOP, following aspects should be kept in mind:

i. SOP should have a simple format and be clear to the user.

ii. It should be specific to the task

iii. All the steps should be clearly mentioned with responsibility matrix and sequence.

iv. It should address the safety, health and environmental considerations in the task including task specific Tools and tackles, PPEs, Hazards involved and Preventive measures

v. It should contain the consequences of deviation in operating limits and steps required to correct or avoid deviation with respect to particular task.

(l) SOP should be reviewed, revised and approved at least every three years in line with Operating manual or earlier as necessary on account of any changes mentioned below:

i. Modification/ revamping of the installation, introduction and/ or deletion of facilities/ equipment/ procedure/ technology etc.

ii. Change in Process Safety Information,

iii. Change in operating conditions/ operations

iv. Changes in applicable statutory, regulatory, OISD standard

v. Learnings from incidents

vi. Suggestions from concerned parties

(m) In case of hired services, SOP (of organization or contractor) which will prevail should be controlled through bridging/ interface document before start of the assignment.

(n) Organizations should establish methodology for effective implementation of SOP - creating awareness; display and accessibility; adherence; verification of implementation of SOP through periodical assurance programs and audits

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7.3 SAFE WORK PRACTICES AND WORK PERMITS

Safe work practices and work permits integrates the accepted safety and health practices into a particular task of non-routine nature and help to control hazards and manage associated risk.

Safe work practice helps to control hazards associated with maintenance and other non-routine work. Safe work practices are statements of what one should or should not do in order to do a job or task safely with minimum risk to people, equipment, material, environment, and process.

Safe work practice guide a worker through a task from start to finish in a chronological order and is designed to reduce the risk by minimizing potential exposure. Safe work procedures are usually developed as a result of a JSA (Job Safety Analysis), Tool Box Talk (TBT), accident or incident investigation, and/or as a supplement to a safe work practice.

Safe work practices are often supplemented with work permits (i.e., checklist that includes an authorization step). Safe work practices and work permits help to ensure communication between the receiver (person assigned to perform the job) and the issuer of the permit.

Some critical activities which may be supplemented by safe work practices and work permits are placed as Annexure 6 (Informative).

7.3.1 While developing safe work practices, following key elements should be addressed:

(a) It should have defined:

i. Scope of the safe work practices (i.e., where certain requirements apply),

ii. Applicability: Identify which safe work practices govern specific activities

iii. Roles and responsibilities and Competence required for development, implementation, issue, receive, approval and review of associated activities (as applicable).

iv. Communication protocol

v. Training requirement and procedure

vi. Revision criterion and frequency

(b) Should highlight specific hazards (may include checklist) that may be encountered while performing the work and specify appropriate safeguards.

(c) Human factors should be considered in the development.

(d) Identification of anticipated or inherent/ specific hazard and risk involved should be done through:

i. Systematic evaluation of stepwise activities involved in the non-routine job or it's execution

ii. Identification of possible unsafe conditions in the surrounding

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iii. Identification of Hazard and risk from other job in the vicinity (if any)

Note: Tools like Job Safety Analysis (JSA)/ Job Hazard Analysis (JHA)/ Task based Risk Assessment (TBRA) are useful for Identification of anticipated or inherent hazard and risk involved.–For details of JSA and TBT with respect to Work Permit System, refer OISD-STD-105.

(e) Prior to the start of the job, all the deliberated solutions to mitigate the risks involved should be put in place.

(f) The identified hazard and risk involved should be communicated to all concerned through checklist, permit and tools like Tool Box Talk (TBT)

(g) Work force should be trained and must know how to effectively authorize and conduct non-routine work. They should be trained to identify the event of deviation, perception of danger and empowered to shut down an ongoing operation in such scenario. They should be trained to

i. Understand the overall system of safe work practices and procedures.

ii. Recognize hazards typically associated with non-routine activities.

iii. Applying procedures and properly filling out permits and checklists.

(h) Consistent implementation of safe work practices should be verified by routinely inspecting worksites, reviewing completed permits etc.

(i) If existing safe work practices cannot be followed, work should be stopped until an appropriate alternative method can be devised and approved.

7.4 TRAINING AND COMPETENCE

The purpose of this element is to outline the processes to be used by organizations to ensure that employees and contractors have the appropriate competencies needed to undertake their work and activities responsibly and safely. This element intends to ensure the provision of all necessary information, instruction, and training as is necessary to ensure the health and safety at work of staff, contractors and others who could be affected by their work activities.

To provide assurance of competence, a Training and Competency Management System should be established, which should contain the minimum required competence and level of assessment required for each role.

7.4.1 **Salient activities under Training and competence Management System should be as follows**:

(a) Each organisation should identify and define competence requirements in terms of qualification, set/ level of skills, depth of knowledge, experience and needs, including training, to meet the competency objectives. This should include HSE, technical and other mandatory competencies.

(b) Gap analysis should be carried out for all employees as and when required, a minimum of once in a three year. Requisite trainings should be imparted based on gap analysis to develop competency.

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(c) Organizations should ensure development of procedure, means of identification of training need and schedule/ calendar of training in line with relevant OISD standards (154 and 176).

(d) A supporting training matrix including training need analysis, training development and delivery should be developed by organizations. This Matrix should identify the minimum training (including HSE related, mandatory trainings etc.) that should be completed at different levels and positions of employees and Contractor personnel.

Note: For the same role, the competency and training requirements should be same for both employee as well as the contractor personnel.

(e) The workforce should be closely supervised while undergoing on-the-job training.

(f) Specific competency profiles should be developed for personnel involved in critical activities like significant HSE risk and/ or activities, legal obligation etc.

(g) There should be a documented procedure for verification and ensuring that training based on technical certification, accredited courses (including certificates submitted as pre-qualification criteria) are carried out only by certified people/ agency.

(h) Training on the Safety Management System should be provided to all concerned.

(i) For new employees and contractor personnel, there should be an induction program addressing the relevant competence requirement, job coverage and possible HSE risks.

(j) All the visitors should be given requisite safety briefing.

(k) A training gap analysis should be conducted for employees moving into new positions, new places (location) taking on added duties and responsibilities and necessary training to be imparted as and when applicable.

(l) Additional refresher training and/or information should be systematically reviewed and provided whenever a site and/or operation is impacted by change, including circumstances such as change in PSI (e.g., new equipment, processes etc.), incident and obligations.

(m) Any Project-specific HSE Training should be identified, recorded and ensured as part of the Facility/ Site HSE Plan.

(n) Organisation should define the criterion and frequency of review of training and competence management system.

7.4.2 ASSESSMENT

(a) The effectiveness of training and competencies should be evaluated and assessed on a regular basis. Organizations should ensure that the competencies and knowledge remain current.

(b) There should be a process for feedback from participants on the effectiveness of trainers/ training providers.

(c) Organization should establish the methods and management practices for training and competency assessment of all employees and contract personnel.

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(d) Competency assessments and verification should only be performed by trained, authorised competent personnel.

7.4.3 TYPICAL TRAINING

Personnel in the installation/ facilities should be trained and retrained for improving their understanding and up grading skill in their area of work based on identification of their training needs. Various type of trainings (but not limited to) as follows;

(a) Functional Training

Each employee, before being involved in operating a newly assigned process, should be trained in an overview of the process and in the

i. Process safety Information

ii. Standard Operating Procedures

iii. Safe work practices and work permits

iv. Safety systems and their functions

v. Emergency preparedness or disaster management plan

vi. Previous incident occurred in the installation/similar installation and learning from incidents

(b) **Refresher Training**

Refresher training should be provided

i. To maintain understanding of and adherence to the current operating procedures.

ii. If site and/or operation is impacted by change, including circumstances such as change in PSI (e.g., new equipment, processes etc.), incident and change in obligations, Requirement of Management of change (MOC) procedure (Refer MOC element for details).

iii. At specified Periodicity (Periodicity of Refresher training should be as per organization requirements as per job demand and feedback. However, same should be in line with applicable OISD standards)

(c) Contractor Training

i. The training provided to contract personnel involved in asset facing activities (performing operating duties, maintenance or repair, construction, civil works, pipeline laying, turnaround, major renovation, or specialty work at the facility) should include work practices necessary to perform their job safely and facility-specific topics such as relevant hazards, relevant safety, environment and security rules, applicable provisions of emergency action plans, any access restrictions etc.

ii. Contractors providing services which do not influence operation of the facility, such as cleaning work, food and drink services, delivery, other supply services, etc. should be trained to perform their jobs in a safe and environmentally sound manner as per defined job competence.

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iii. Contractors should receive training in emergency evacuation and other applicable safety aspects.

iv. Contractors should also familiarize themselves with the applicable environmental aspects and requirements like air emission, oil spills, soil and groundwater contamination etc.

7.5 CONTRACTOR MANAGEMENT

In the Oil and Gas industry where contractors are deployed to accomplish various types of jobs of different nature, it is very much essential to formulate an elaborate system for ensuring their safety at work place.

Every organization should develop, establish and maintain a contractor management system. The intent of contractor management should be to implement practices to ensure that contractor personnel can perform their jobs safely. The key principles and essential features of a contractor management system are as follows:

7.5.1 MANAGEMENT RESPONSIBILITIES

(a) Management should maintain procedures to ensure that its contractors operate a safety management system that is consistent with the requirements and provisions compatible with the Safety Management System of the organization.

(b) Procedures should facilitate interfacing of contractors' activities with those of the organization and with those of other contractors, as appropriate. This may be achieved by means of a specific bridging/ interface document between organization and contractor so that any differences may be resolved, and procedures agreed, before work commences.

Note: The bridging document should be more comprehensive, encompassing every aspect of Safety Management System of both organization and contractor including all actions to be taken during normal and abnormal conditions, emergency management PPE (requirement and specifications), competency required, communication protocol etc.

For a sample showing key elements of bridging document, refer Annexure 7 (Informative).

(c) A robust mechanism should be developed for evaluating the performance of the contractor during pre-selection stage

Note: The performance evaluation at preselection stage should be based on the defined HSE criterion developed by an organization. Parameters like safety leading indicators, lagging indicators, HSE Management framework, relevant work experience, required competencies of the workers and supervisors, legal requirements etc. should be considered in the defined criterion.

Note: Organizations should have Quality and Cost Based Sourcing (QCBS) procedure of contracting.

(d) The competency of the contractor personnel w.r.t. the specific trade/ work for which the person is hired should be defined and ensured. Organization should maintain records on the competency assessment.

Note: For the same role, the competency and training requirement should be same for both employee as well as the contractor personnel.

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(e) Management should also plan a kick off meeting with the contractors mobilized at the work location. The following basic requirements should be explained/ communicated in detail to the contractors.

i. The known potential fire, explosion, or toxic release hazards related to the contractor's work and the process;

ii. The applicable provisions of the emergency action plan and their role in case of emergency.

(f) Develop and implement Safe work practices and procedures to control and ensure the presence, entrance, exit and safety of contract employers and contractor personnel in designated/non-designated area.

Note: Organizations should ensure that the requirement and specification of personal protective equipment should be same for both employee as well as the contractor personnel for same job and work environment.

(g) Identify orientation and training requirements for contractor personnel, defining who is responsible for performing the training and identifying. The records of the same should be maintained.

(h) The management should verify contractor training utilizing a variety of methods, which may include audits of the contractor's environmental, health and safety training programs; and observation of contractor work performance.

(i) Maintain a contract worker injury and illness log related to the contractor's work.

(j) Ensure for regular safety inspection of its own as well as contractors' equipment/ tools and tackles by authorized representative.

(k) Conduct safety meeting with all the contractors at defined intervals (minimum one per contract employer per month). They should be communicated on the safety performance, violations, concerns arising out of inspection, audit etc. Obtain feedback/ Concerns from the contractors and act accordingly.

(l) Develop and maintain robust mechanism for evaluating the performance of the contractors (including Annual Rate Contract) through periodic assessments/ audits after deployment in the organization.

Note: A well-documented method for monitoring and assessing contractor performance against agreed HSE objectives and performance criterion should be developed and implemented for performance evaluation. It should include parameters like safety leading indicators, lagging indicators, job compliance, audit scores, adherence to SOP, legal requirements, Safety violations etc.

(m) Management should develop a defined procedure for necessitating disciplinary action and/ or penalty against the contractor in case of any safety violations. These violations should be recorded for their performance evaluation.

(n) Management should develop a defined procedure to promote and implement an incentive scheme which values positive HSE performance.

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7.5.2 CONTRACT EMPLOYER (CONTRACTOR) RESPONSIBILITIES

(a) Contractor should comply with applicable regulations, standards and policies as well as waste management and spill prevention practices.

(b) The contractor should ensure that every contract personnel under him follow the safety rules of the facility including the applicable and recognized safe work practices (e.g. work permit system etc.), standard operating procedures of the organization.

(c) Contractor should declare that each of their personnel has received and understood their roles in safe working practices and emergency response by preparing a record and should verify the efficacy of dissemination of the safety information (Refer Specimen template for Declaration format in Annexure 7).

(d) The contractor should check and ensure the documents viz. qualification, experience, training certificate submitted by the personnel are genuine.

(e) The contractor shall provide adequate and correct personal protective equipment at work place as per contract/ best safety requirement as recommended by the organization and ensure all contractor personnel are trained in its use and that it is used properly.

(f) The contractor shall ensure that Contractor's personnel shall, inspect all PPEs prior to each use. Such inspections shall include identifying obvious signs of wear, tears, holes, cracks or leaks, proper function of closures, if any. Any PPE found to have excessive wear, tears, punctures, or any defect of any nature shall be discarded and replaced with new PPE.

(g) The contractor should keep the management informed of any specific hazards presented by the contracted services.

(h) The contractor should provide and maintain work places, installation, equipment, tools and machinery properly organized such that it does not pose any additional hazard.

(i) The contractor should assign workers only that job for which they are suited by their age, physique, state of health and competence.

(j) The contractor should provide adequate resources for supervision and safe execution of the job as per the procedure agreed. He should also encourage and ensure reporting of all the incident related to his/ her work.

(k) The contractor should maintain a contract personnel injury and illness log related to his/ her work.

(l) In case the entire facility/ installation is handled by contractor, the same shall be guided according to bridging document signed between the Operator and the Contractor. (Refer Annexure 8 for key elements of bridging document).

Note: All requirements mentioned here should be applicable to the main contractor whether or not it sublets (subcontracts) some or all of the work covered by the contract. In the case of subletting (partial or full), prime responsibly of compliance with the above will remain with the main contract employer. He/ she should ensure compliance through subcontractor.

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7.5.3 CONTRACTOR WORKMEN (WORKFORCE) RESPONSIBILITIES

(a) Contractor workforce at every level are expected to perform their duties with alertness, due thought, full knowledge, sound judgement, and a proper sense of pride and accountability.

(b) The contractor's workforce should make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipment.

(c) The contractor workforce should take an active participation in the safety & health programs, suggestion systems, trainings, reporting to all injuries, any unsafe act and condition or incident to ensure their own safety and injury free employment.

(d) The contractor workforce should ensure that equipment and materials shall only be stored in designated areas appropriate for that material.

(e) A Job Safety Analysis should be understood by each contractor workforce that may be performing any of the functions of the task under such job safety analysis.

7.6 SAFE OPERATION MANAGEMENT

A Safe operation management programme should be developed and implemented which should establish clear expectations for every asset facing activity/ operations such as following procedures, expectations from workforce, clear instructions for safe and controlled operation, its monitoring, controlling access to hazardous areas, reliable communication etc.

The salient features of programme should be:

7.6.1 WRITTEN PROCEDURES

Operating Procedures (Operating manual, SOP)/ Standard Maintenance Procedures (SMP)/ safe work practices should be developed, reviewed, approved, updated and established in line with respective elements as explained in clause # 7.2 and 7.3.

7.6.2 QUALIFICATION AND TRAINING OF WORKFORCE

Work force should be qualified, trained and competent for the tasks they are expected to perform. (Refer Training and Competence element for details)

7.6.3 ASSIGN ADEQUATE RESOURCES

The organization shall determine and provide the resources in terms of manpower needed for the establishment, implementation, maintenance and continual improvement of the Safety Management System.

Adequate operating/ support facilities (such as safe sitting arrangement, cabins, illumination etc.) and adequate equipment (such as walkie-talkie/ radios, gas monitors/ responders etc.) should be provided for carrying out the operation in a safe manner.

7.6.4 FORMALIZE COMMUNICATIONS

The organization shall establish, implement and maintain the process(es) needed for the internal and external communications relevant to the Safety Management System.

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Documented system to be developed for proper communication among the various levels such as management circulars, work instructions, standing instructions, shift handing over taking over, shift logs, safe work practices, consultation and participation.

(a) Work Instruction:

i. Work instructions with respect to scheduling, planning of activities, and specific precautions for the conduct of operation on day to day basis as applicable should be given by supervisor.

ii. These instructions should be specific, adequately detailed and in language understood by the concerned to avoid any miscommunication/ unsafe operation.

iii. These instructions should be understood and acknowledged by operating personnel before execution.

iv. An instruction register (Online/ offline) (controlled document) should be developed. (Refer Annexure 4: General document control features)

(b) Standing Instruction:

Standing instructions should be developed which can be referred and followed in case of emergency situation, incident inside installation premise like emergency escape/ exit route, assemble at designated place (assembly point) and other specific instructions for critical job etc.

(c) Shift handing over and taking over and shift logs

i. Structured shift handing over and take over procedure should be developed and implemented.

ii. Proper and accurate logging of data should be ensured.

Annexure 9: General Guidelines for developing Shift handover/ take over procedure and recording information in logs.

iii. Supervisors should periodically review and countersign the logs for accuracy and completeness to emphasize their importance.

7.6.5 ADHERE TO SAFE OPERATING LIMITS, LIMITING CONDITIONS FOR OPERATION, ALARM MANAGEMENT

(a) Adherence to Safe Operating Limits/ Window, Integrity Operating Window and limiting conditions for operation should be ensured. Record of changes/ deviation in above with proper approval as per organization policy/ MOC should be maintained

(b) Alarm set values should be in line with the master alarm database (MADb). Record of changes in master alarm database (with proper approval) should be maintained.

(c) A system for Process Alarm management and rationalization should be developed and implemented (Refer OISD-STD-152 for details) to facilitate accurate and timely fault prompting and diagnosis to operators, and hence more effective alarm management system.

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(d) The healthiness and operability of the interlock system should be tested at a defined frequency. Record of the same to be maintained. The frequency and procedure of interlock testing should be documented in the operating manual.

(e) Ensure that those authorizing deviations or changes in operating limits or interlock bypass are well aware of the risks and have a sense of vulnerability.

7.6.6 INTERLOCK BYPASS MANAGEMENT

(a) Process Interlock/ Equipment Interlock if required to be bypassed, exposes the installation operations to unknown hazards. Interlocks are bypassed for short or long duration to attend instrument/ process/ equipment problems during start up/ shutdown, normal operations, equipment changeover etc. However, endeavor should be made to keep all interlocks in line for the safety of the equipment/ installation.

(b) Organizations should develop and maintain an approved documented procedure for Interlock bypass management . The salient features of the same should be as follows:

i. All the operational/ process/ equipment interlocks should always be kept in line. If required to be bypassed, Interlock bypass procedure should be followed and record of the same should be maintained. It may be best practice to have automatic event logging of every interlock bypass.

ii. The delegation of authority for approving the bypass any safety interlock with respect to period should be clearly defined.

iii. An interlock bypass register (controlled document) should be maintained by each operation unit/ section. It should be readily available with shift-in-charge. (Refer Annexure 4: General document control features)

Note: The register can be maintained in soft (e- system)/ hard copy.

iv. The register should contain tag no. of bypassed interlock, tag description, date and time of bypassing the interlock, reasons for bypassing, compensatory measures, precautions to be taken during the period of interlock bypass and date and time of taking the bypassed interlock back in line along with the signature of the approving authorities as per the delegation of authority.

v. After three months, documented review of necessity of Interlock, further course of action should be done on monthly basis.

(A specimen Interlock bypass procedure and formats are attached as Annexure 10)

7.6.7 ACCESS CONTROL REQUIREMENTS AND OCCUPANCY

(a) Proper signage (such as ‘Entry restricted’, “Hard hat area” etc.) and necessary standing instructions, Safe work Practice should be developed for access control requirement and occupancy in the operational areas.

(b) Examples of access controlled areas:

i. Control rooms,

ii. Process areas by non-operational personnel,

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iii. Areas of the facility where special hazards exist

iv. Substations/ Electric panel rooms

7.6.8 FIELD ROUNDS AND EQUIPMENT MONITORING

(a) Concerned operating workforce should take periodic round of the field/ area. They should physically inspect equipment on regular tours or rounds.

Note: Local readings confirm the accuracy of remote instrument readings and reveal incipient problems that require attention.

(b) Specific field equipment inspection logs books for operator rounds should be developed and implemented.

(c) Periodic checking of Safety Critical Equipment (SCE) e.g. Pressure Safety Valve (PSV), Emergency Shutdown Device (ESDs), Emergency depressurization valve, deluge valve etc. and their healthiness should be ensured and documented. Any deviation/ non availability/ impairment should be duly logged, approved and communicated to all concerned with alternate mitigation measures/ course of action. SCE which are not available/ by pass should be marked in field also.

(d) The workforce should be trained to identify and report any abnormality/ deviation/ unsafe condition like leak, odd noise, unusual smell etc., unsafe act like noncompliance of procedure, PPEs etc. Appropriate corrective action for all such reported events should be ensured as soon as possible. Feedback should be communicated to the reporter.

Note: Use of mounted CCTV cameras at installation should be done for monitoring of high risk activities, unsafe acts, unsafe condition etc.

7.6.9 MAINTAIN GOOD HOUSEKEEPING

(a) Working areas should be kept clean and organized, trash should be removed, damaged equipment should be repaired, paint and surface finishes should be maintained, abandoned equipment should be demolished.

(b) Emergency escape routes should be free of any obstructions.

(c) 5S (sort out, set in order, standardize, shine and sustain) are some of the practices which helps in maintaining good housekeeping.

(d) Hazardous waste storage and disposal should be ensured in line with the applicable regulatory requirements.

(e) Adequate illumination should be ensured in accordance with OISD-STD-149.

7.6.10 LABELING AND COLOUR CODE

(a) Organization should have facility-wide standards for labelling and colour coding of equipment, pipelines etc. for reliable operation/ emergency management.

(b) Location of various emergency equipment/ life saving appliances such as safety showers, ESD, Manual Call Point (MCP), Assembly Point, Public Address System, Emergency Exit, PPE Station, firefighting equipment, life jacket, raft etc. should be distinctly marked for easy identification.

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7.6.11 PROCESS MOCK EXERCISES

Periodic Process mock **exercises** should be conducted in process installations for hands on emergency handling experience for asset facing supervisors and workers.

Typical Mock **Exercises** topics are as follows:

i. Process equipment failure

ii. Instrument malfunction

iii. Utility Failure such as Instrument air failure, cooling water failure, total power failure etc.

7.7 ASSET INTEGRITY MANAGEMENT (AIM)

Asset Integrity Management is the means of ensuring that the people, system, process and resource that deliver integrity are in place, in use and will perform when required over the whole lifecycle of the asset. It is continuous assessment process applied throughout the lifecycle of assets to assure that the assets are and remain to be fit for purpose. In this context integrity is defined as the prevention of the loss of containment of a material or energy from the facilities which covers the equipment, its support structures and those other systems that prevent, detect, control or mitigate against a hazard which may result in a major accident.

The activities related to AIM change as a facility's life cycle progresses.

These activities should be fulfilling four major objectives:

i. Define the requirements to be achieved by the asset.

ii. Design and build integrity into new and modified asset.

iii. Maintain the integrity of the asset throughout the facility lifetime.

iv. Detect and correct deficiencies and failures that occur during operation.

7.7.1 ASSET INTEGRITY MANAGEMENT (AIM) PROGRAMME

Asset Integrity Management (AIM) programme should ensure that procedures are in place and implemented in a manner to serve its intended function without chances of failure consistent with service requirements, manufacturer's recommendations and industry standards.

Each organization should implement the AIM programme covering various stages of lifecycle of an asset. The assets including safety critical equipment to be covered under AIM should be clearly identified and listed.

The various stages of asset lifecycle and respective salient features of AIM program which required to be addressed are as follows:

i. Concept stage

ii. Design

iii. Procurement

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iv. Fabrication

v. Installation and commissioning stage

vi. Maintenance, Inspection, Testing and Calibration stage

vii. Decommissioning

7.7.2 CONCEPT STAGE

(a) Organisation should establish AIM program requirements and objective before the start of the process design.

(b) Asset management program should include road map for maintaining integrity and availability of asset such that organisational objectives are converted into AIM objectives.

7.7.3 DESIGN STAGE

(a) Various aspects of "Build in" reliability and inherent safety in assets to be reviewed and incorporated at design stage to achieve higher reliability, availability and safety.

(b) Technical and personnel safety aspects such as safe access, approach, escape etc., operability and maintenance aspects such as ergonomics etc. w.r.t. equipment should be reviewed and ensured.

(c) The design of safety critical equipment should be reviewed to ensure its availability and operability for the intended purpose and survival during emergencies/ events (such as initial fire or explosion) envisaged during design.

(d) Organization should develop and maintain design documentation up to date and readily accessible (refer PSI element).

7.7.4 PROCUREMENT STAGE

(a) Guidelines for procurement should be developed to verify and ensure equipment compliance with applicable design and material specifications.

(b) It is recommended to conduct an audit of the equipment supplier's facilities to better assure purchase of required equipment which is suitable for intended use.

7.7.5 FABRICATION STAGE

(a) Written guidelines for quality control and assurance procedures and specifications for asset should be developed and implemented to ensure that material, construction and procedure (fabrication and inspection) during the fabrication stage are in accordance with the design specifications.

(b) In the construction of new installation and equipment, it should be ensured that equipment as it is fabricated is suitable for the process application for which it will be used.

(c) Calibration/ standardization of equipment and instrumentation required/ used for fabrication should be ensured.

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7.7.6 INSTALLATION AND COMMISSIONING STAGE

(a) Guidelines on appropriate checks and inspections such as Positive Metal Identification (PMI), Hydrostatic Pressure test, Vacuum box test etc. (whichever applicable) to be performed before start up to ensure that the equipment are installed properly and is in accordance with design specifications and the manufacturer's recommendations, should be developed and implemented.

(b) Procedure to ensure that installation procedures recognize field installation concerns should be developed and implemented.

(c) 'As built' drawings, together with certifications of vessels and other equipment and materials of construction need to be verified and retained in the quality assurance documentation. (refer PSI element)

(d) Equipment installation jobs should be inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job.

(e) Use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods etc. should be verified in the field and documented.

(f) The procedure for installation of safety devices should be verified such as torque on the bolts on rupture disc installation, uniform torque on flange bolt, proper installation of pump seal etc.

(g) Pre Commissioning Safety Audit (PCSA) of the installation/ facilities shall be carried out in accordance with relevant OISD standards during installation and commissioning stage.

7.7.7 MAINTENANCE, INSPECTION, TESTING AND CALIBRATION STAGE

(a) Risk Based maintenance and inspection programme as applicable should be established and implemented taking into consideration the safety, reliability and quality aspects to achieve objective of Asset Integrity Management (AIM).

(b) The statutory requirement, manufacturers recommendation, requirements by relevant OISD and other National/ International codes and standards, SOPs for Integrity assessment by national and international bodies and Recognized and Generally Accepted Good Engineering Practices (RAGAGEPs) should be considered in developing such programme.

(c) Maintenance and Inspection programme should include:

i. The frequency/ schedule, procedure, practice and responsibility for operation, maintenance, inspection, testing, calibration, corrosion control etc. as applicable shall be clearly defined, approved and periodically reviewed based on aging, deterioration mechanism and failure history.

ii. Each inspection and test done on equipment and its components should be reviewed against the established criterion for acceptance and documented.

iii. Strategies for management of spare parts, consumables, tools and tackles

(d) Quality control procedures to verify that maintenance material, spare parts and component, spare equipment etc. meet design specifications.

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(e) Plan for management of safety critical equipment and emergency response equipment and systems.

(f) Training of maintenance personnel in the application of the procedures, relevant hazards, safe work practices and standard operating procedures etc.

(g) Procedure to review all changes in facilities in accordance with MOC guidelines. A comprehensive review of the impacts of potential change (e.g., increase in vibration, increase in corrosion etc.) is to be undertaken before implementation.

(h) Plan and methodology for analysis of failure, its documentation and reporting criterion (Failure data from operating experience should be documented and analysed)

(i) Feedback from maintenance activities should be given to other elements of safety system i.e., design and operations for updation of P&IDs, changes in design of asset and operating manuals as required

(j) Strategies for outsourcing of services/ ensuring safety in outsourced jobs (refer contractor management element for details)

(k) Procedure and responsibility for approval of deviation from inspection and maintenance programs.

Note: All the aspects of deviation approval should be addresses in this procedure. (Refer Annexure 11: Specimen procedure for deferment of scheduled Maintenance, Inspection, Testing and Calibration).

(l) Consideration for improving reliability of equipment such as Reliability modelling in design stage, Failure Analysis, Reliability Cantered Maintenance, Root Cause Analysis, Risk Based Inspection etc. and its monitoring using established reliability parameters like Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR), availability etc.

(m) Strategies and Procedure for preservation of idle assets and equipment/spares kept in stores/ installations. (Refer OISD-STD-171 for details).

7.7.8 CRITERIA FOR ACCEPTING EQUIPMENT AFTER MAINTENANCE

Following considerations as applicable should be considered while accepting equipment after maintenance:

(a) Asset that has been out of service for maintenance should be taken over after due testing and documentation.

(b) Criteria for acceptable test results should be well defined.

(c) Equipment Asset deficiencies which are outside acceptable limits as defined by the process safety information should be corrected before further use or in safe and timely manner, when necessary, means are taken to assure safe operation. Any deviation accepted should be approved by authorized person.

(d) Proper records for handing / taking over of equipment should be maintained.

(e) After any maintenance, Pre-start up safety review as applicable should be carried out and documented in accordance with PSSR element.

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7.7.9 DECOMMISSIONING STAGE

(a) Strategies and criterion for equipment replacement and decommissioning should be established and implemented.

(b) Procedure and responsibility for approval of deviation from replacement and decommissioning criterion should be defined, followed and documented.

(c) Management of change procedure should be followed for equipment replacement and decommissioning in line with OISD-GDN-178.

(d) All the relevant PSI documents should be updated

7.7.10 MAINTENANCE PROCEDURES

(a) Documented procedures should be established and implemented to maintain the on-going integrity of process equipment, installation and structure. The procedure should address to the safety aspects regarding task performed on the asset

(b) In addition to the preventive maintenance procedure, written Standard Maintenance Procedures (SMP) for each type of routine repair performed by maintenance personnel should be prepared.

(c) The procedures should contain the minimum following information:

i. The use of personal protective equipment should be laid down for specific maintenance activities.

ii. The task, role and responsibilities should be defined

iii. Records of trend analysis of machine and equipment should be taken into consideration.

iv. The risks associated with different phases of maintenance should be established.

v. All maintenance procedures should be duly authorized.

(d) Results of inspections and tests performed on process equipment are to be recorded and maintained in master File, or electronically and should be accessible to all concerned.

(e) Maintenance and inspection activities should also address the integrity of temporary equipment.

7.7.11 PERFORMANCE REVIEW

It is essential to carry out periodic review of implementation status and performance of Asset Integrity Management (AIM) programme by authorized person of the organization. Such review should essentially cover:

(a) Plans, schedule and Key indicators for performance measurement of the Asset Integrity Management system and implementation of findings/ recommendations.

(b) The programs and schedules should be reviewed and analysed to see if there are areas where break down maintenance is used rather than an ongoing AIM program.

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7.8 MANAGEMENT OF CHANGE

An industry is subjected to continual change to increase efficiency, improve operability compliance to health, safety and environment regulations, accommodate technical innovation/ changes, improvement in reliability, energy consumption and profit etc. On occasion, temporary repairs, connections, bypasses, or other modifications may be made out of operating necessity. Sometimes change in legal requirement, changes in codes/ standard, audit recommendations, incident investigation recommendations etc. can also necessitate change.

Any of these changes can introduce unforeseen new hazards, unknowingly increase the risk associated with existing hazards or compromise the safeguards built into the original design. Such changes, if not carefully controlled, can increase the risk of process or operation and result in unwanted consequences.

7.8.1 The organization should develop, implement and establish documented procedure to manage changes in accordance with OISD-GDN-178 "Guidelines for Management of Change".

7.9 INCIDENT REPORTING, INVESTIGATION, ANALYSIS AND LEARNING

An incident is an event caused by failure in the safety-barrier or safeguards installed that results or has potential to result in fire, explosion, run away reaction, Process Safety Event - Loss of Primary containment (LOPC), injury or fatality. An incident is an indication that safety barriers were ineffective/ impaired and that prompt changes need to be made.

Major Incidents or major potential incidents including high potential (Hi-Po) near misses recur unless key factors responsible for incidents are analyzed and corrected. Therefore, Incident management is an essential part of a comprehensive Safety Management System. The intent of the incident management should be to learn from the incident and help to prevent recurrence of similar incidents. A corrective action program and dissemination of learning to required stakeholders should be established based on the findings of the investigation to prevent recurrence.

Every organization should develop, establish and maintain an incident management system which should address following key aspects;

7.9.1 ROLE, RESPONSIBILITY AND ACCOUNTABILITY IN INCIDENT MANAGEMENT

Everyone in an organization has a role and responsibility to play in incident reporting and investigation program. While the workforce have a responsibility of reporting the incidents and taking immediate action to prevent escalation, the leadership has a responsibility to provide necessary resources for establishing Incident management system in the organization. Organization should develop Incident management program comprising of following aspects:

(a) **Incident Reporting**

Following aspects should be considered for development of incident reporting guidelines:

i. All the incident (including near miss/ injury/ minor/ major etc.) should be reported.

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ii. The guidelines should also emphasis on and have provision for reporting of unsafe act and unsafe condition separately. All the reported unsafe acts and unsafe conditions should be analyzed, rectified and findings should be shared with all concerned.

iii. Awareness programme on reporting of unsafe act, unsafe condition & Incident for the workforce should be conducted periodically.

iv. Timelines for reporting the incident

v. Criterion for incident classification of various incidents based on their severity/ consequence.

(OISD Incident classification and reporting criterion is attached as Annexure 12)

vi. The reporting form/ template and timelines should be aligned to the Incident classification criterion, reporting requirement of statutory and regulatory authorities[4] and other applicable agencies).

vii. Define the system, procedure and tools available to report the incident.

viii. Barricading and securing of the scene

Note: The organization should encourage reporting off-the-job safety incidents of the employees and develop & maintain necessary system for the same. These incidents should be analyzed and findings should be shared with all concerned.

(b) **Investigation of incident:**

Incident investigations should be initiated as promptly as possible considering the necessity of securing the incident scene, relevant evidence, information and protecting people and the environment.

This section should address

i. The criterion for investigation (which type of specific events should be considered as HSE incidents, requiring comprehensive investigation)

ii. Defined timelines w.r.t investigation process

iii. Constitution of investigation team,

iv. Criterion for selection of Team leader and members.

v. Methodology of investigation,

vi. Reviewing and approving process,

vii. Submission of Report in standard template for documenting facts, findings (Physical observations, process parameters, Time stamping, Key witnesses, Photographs etc.) key factors, analysis and recommendations

[4] *Statutory requirements derive from legislation that has been enacted into law and passed by a State and/ or Central Government whereas Regulatory requirements derive from rules/ regulations, which have been issued by a regulatory body appointed by a State and/ or Central Government.*

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Refer annexure 13 (a) List of sample questions which Investigators may ask to witness (b) List of sample questions for identifying incident root causes (Informative)

(c) **Communication of learning.**

i. Organization should establish the procedure on learning from internal and external incidents. These high value learnings should be coupled with actions directed to prevent the similar incident happening at the facility.

ii. The Learning from incident (LFI) should be communicated to all relevant stakeholders for e.g.

- Similar facilities within the organization.
- Personnel whose job tasks are relevant to the incident findings including contract workforce when applicable.

iii. The learnings should be considered as one of the inputs for future Hazard analysis, Risk assessment revision, induction / regular trainings etc.

(d) **Documentation of incident investigation report and other record.**

Organization should establish a system of maintaining an incident data base wherein information is properly recorded in a form suitable for easy use. Incident investigation reports to be retained for a minimum period of five years in order to determine if an incident pattern develops or exists.

(e) **Corrective Actions, Recommendation tracking and Implementation**

A procedure should be established to promptly address and resolve the report findings and implement recommendations. Resolution and corrective actions should be documented.

The procedure should address

i. Tracking and monitoring of open, overdue and closed recommendation status.

ii. The validation of effectiveness of closed recommendation.

(f) **Training and competency of investigation team and other stakeholders.**

Organization incident management program should ensure that investigators and others engaged in incident investigations (like reviewer, approver, etc.) are trained in the techniques of Incident investigation.

(g) **Analysis of Incident Data:**

Organisation should develop a system for analysis of incident data which can be used for preventing recurrence and set the warning signals to prevent major incidents. Refer ‘Case Studies’ and ‘Safety Alerts’ of major incidents within the premises in the OISD portal under section Knowledge Management.

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7.10 EMERGENCY RESPONSE MANAGEMENT

Emergency response management is a critical component of safety management system. The objective of Emergency response management is to mitigate adverse effects of incidents through effective risk assessment, emergency preparedness, mitigation and response measures.

Each organization should develop, implement and establish emergency response and disaster management plan in accordance with all applicable statutory/ regulatory/ OISD guidelines such as OISD-GDN-227/ MOP&NG DMP/ PNGRB ERDMP Regulation-2010 and amendments thereof.

7.11 TRANSPORT SAFETY MANAGEMENT

Large volumes of petroleum products are transported through road, rail, sea/ waterways & pipelines, and each transport mode has specific hazard and associated risk. To ensure the safety of the personnel involved directly or indirectly such as public or community, it is essential that each mode of operation is designed, operated and maintained as per defined statutory requirements, codes and standards.

7.11.1 CLASSIFICATION OF HAZCHEMS

Every goods carriage, carrying petroleum products (whether in bulk or in packages), should display a distinct mark of the United Nations (UN) class label appropriate to the type of HAZCHEMs. In India, the classification of HAZCHEM as recommended by the UN Committee of Experts on the Transport of HAZCHEMs has been widely adopted for all modes of transport.

Refer Annexure 14 for UN international classification system / Code Number & Letters for important and popular chemicals(Informative).

7.11.2 TRANSPORTATION BY ROAD TANKERS

It is required that all organizations, operating road transportation or providing services involving road transportation have a management system in place that covers road transportation operations and that is based on a full assessment of the risks and measures to address such risks.

All applicable statutory Act/ regulations and their amendment thereof such as Motor Vehicles Act of 1988 with latest amendments, Central Motor Vehicle Rules, 1989, Petroleum Rules, 2002, SMPV Rules of 1981, The Public Liability Insurance Act, 1991 should be complied.

Safety requirements with respect to design, safety fittings, operations, loading/ unloading, periodic inspection and maintenance, rescue, relief emergency handling in line with following OISD standards should be complied.

(a) OISD-STD-128 : Inspection of unfired pressure vessels

(b) OISD-STD-135 : Inspection of loading and unloading hoses for petroleum products

(c) OISD-RP-157 : Recommended Practice for Transportation of Bulk Petroleum Products

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(d) OISD-STD-159 : LPG Tank Trucks - Requirements of Safety on Design/Fabrication and Fittings

(e) OISD-GDN-161 : LPG Tank Truck Incidents: Rescue and Relief Operations

(f) OISD-GDN-165 : Guidelines for Rescue and Relief Operations for POL Tank Truck Accident

(g) OISD-RP-167 : POL Tank Lorry Design and Safety;

7.11.3 TRANSPORTATION BY PIPELINES

Statutory provisions and requirements for transportation of petroleum products by pipelines are governed under Petroleum rule 2002, The Petroleum and Mineral Pipelines (Acquisition of Right of User in Land) Rules 1963 and PNGRB regulations, other requirement with respect to design, construction, maintenance, laying are defined in OISD standards (as applicable), should be followed.

(a) OISD-STD-139 : Design, Construction, Inspection and Maintenance of Offshore Pipelines and Facilities and Requirements of Deep Water Pipelines

(b) OISD-STD-140 : Inspection of jetty pipelines

(c) OISD-STD-141 : Design and Construction requirements for cross country liquid hydrocarbon pipelines

(d) OISD-STD-188 : Corrosion Monitoring and Control of Offshore and Onshore Pipelines

(e) OISD-STD-214 : Cross Country LPG Pipelines

(f) OISD-STD-226 : Natural Gas Transmission Pipelines and City Gas Distribution Networks

(g) OISD-GDN-233 : Guidelines on inspection of non-piggable pipelines

Organization should have Emergency Response and Disaster Management Plan for pipeline transportation in line with the guidelines given by PNGRB and OISD standard.

7.11.4 TRANSPORTATION BY SEA/ WATERWAYS

Statutory Acts/ Rules/ Regulations governing water transportation of oil and gas should be complied.

Inland waterways transportation is governed by the various directives issued by the regulatory authority. Merchant Shipping Act, 1958 has been developed for registration, certification, safety and security of Indian ships.

For safety for LNG bunkering facilities at ports for large ships, coastal shipping and inland water transport (IWT) terminals, OISD-STD-245 should be followed.

7.11.5 TRANSPORTATION BY RAILWAYS

The Transportation of petroleum products through railways should be carried out in accordance with Indian Railways Act and Red Tariff No.19 of Indian Railways Conference Association.

For details Refer OISD-RP-157

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7.11.6 EMERGENCY OPERATIONS

(a) Emergency Plan covering roles and responsibilities during the crisis situation and trainings required for different types of crises arising due to natural and man-made disasters, communication matrix for various scenarios like loss of containment, medical emergencies, road incidents etc. should be developed and implemented.

(b) The plan should be periodically reviewed.

(c) Mock drill on emergency handling during transportation should be carried out once a year or as per applicable statutory regulations (whichever is less).

Note: Organization should have Emergency Response and Disaster Management Plan for road, rail and pipeline transportation in line with PNGRB regulations on ERDMP, other applicable rules and regulations, MoPNG DMP and OISD standards.

7.12 PROJECT HSE MANAGEMENT

The purpose of this section is to provide guidance to project delivery on how to align and comply organization's SMS standard for projects lifecycle.

These guidelines provide the required structure for HSE management in projects. It facilitates preventive approach to risk management as appropriate risk control and mitigation measures that can be incorporated in early stage of projects or at various stages of project.

Key Project HSE management activities include:

(a) Development of HSE risk management strategy (as part of the overall project risk strategy),

(b) Development of a Project HSE Management Plan.

The HSE Management Plan describes the key management systems that the project should use to manage the risk.

7.12.1 PROJECT HSE RISK MANAGEMENT STRATEGY

HSE risk management strategy should be based on following basic consideration:

(a) Safety in Design: This process involves major hazard identification, evaluation and continuous risk reduction through design safety measures.

(b) Environmental and Social: Basic objective of this aspect is to identify and understand the environmental and social impacts of new project, design to avoid adverse impacts, minimize use of natural resources and reduce the adverse residual impact of waste, emission and discharge.

(c) Health Risk: Health Risk Assessment and health risk management is essential to ensure that personal, occupational, and environmental health risks in projects and operations are managed properly in line with applicable statutory regulations and applicable guidelines.

(d) Risk Management: Risk management should include identification of hazards associated with operations, assess the risk, manage holistically and formally document the details.

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(e) Emergency Response: Emergency Response should be considered as part of the project development, based on identified hazards and risks associated with the project and its activities including those developed from the HIRA/ PHA.

(f) Regulatory and Compliance: The HSE compliance framework should detail the requirements for HSE compliance management process.

7.12.2 PROJECT HSE PLAN

(a) A Project Health, Safety, and Environmental (HSE) Plan should be developed and owned by the project team, which specifies all HSE studies and requirements throughout all stages of a project.

(b) HSE Plan is specific to each project and details the timing of all HSE studies, audits, reviews, preparation, verification and submission for approval at certain phases of the project.

(c) The HSE Plan is developed at pre-project/ conceptual stage, then updated and formally issued prior to the commencement of each succeeding phase of design development, when a closer definition of HSE requirement has been established.

(d) The HSE plan should be revisited/ updated during

i. Conceptual phase - when surface facilities are being identified,

ii. Basic Engineering (FEED stage) – to incorporate more specific design requirements, and

iii. Detailed Engineering stage – to incorporate construction and commissioning requirements during EPC stage.

(e) The purpose of the HSE Plan is to ensure that all projects follow organization's Standards and practices and adhere to Organization HSE lifecycle phases.

(f) A project specific HSE philosophy should be developed based upon philosophies, also the specific codes and standards adopted on the project. The HSE Plan should be prepared and developed in conjunction with the projects HSE philosophy document, which when combined contain all HSE requirements on any new project from concept to commissioning phase.

(Refer Content of a typical project HSE plan attached as Informative annexure 15)

7.12.3 PROJECT HSE ASSURANCE PROCESS

(a) Project HSE Review (PHSER) is an element of a project's assurance strategy. PHSER's heighten the awareness of HSE risks and help make HSE an integral part of the gated decision and HSE approval process for projects.

(b) The overall objective of a PHSER is to provide assurance that all HSE aspects of the project have been identified and that the appropriate project, engineering, construction and operational procedures have been or will be developed to control risks identified. The PHESR process has multi stage as listed below:

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i. PHSER Phase I - FEED or Basic engineering stage

ii. PHSER Phase II - Detailed engineering stage

iii. PHSER Phase III - Construction stage

iv. PHSER Phase IV - Pre startup stage

v. PHSER Phase V - Post operation stage (After one year)

vi. PHSER Phase VI - Abandonment stage

(c) The requirements under PHSER review process are as under:

i. To confirm that HSE Management System including HSE Plan, and HSE action Tracking Register has been established/ implemented effectively.

ii. To verify that HSE studies, including specialist reviews such as HIRA/ PHA, PHSER, QRA, EIA etc. have been conducted and that the outcome of these studies have been satisfactorily addressed/ incorporated in the design and in the EPC Package. To ensure that the HSE related aspects of the FEED meet regulatory requirements, project codes, standards have been identified and design philosophies have been established/ applied.

iii. To confirm that Management of Change procedures (MOC) which include design change and engineering change have been developed and applied and appropriate hazard review of changes has been instigated to maintain HSE integrity.

iv. To confirm that all the HSE related aspects, requirements and instructions for construction phase have been identified and documented in the EPC Package.

v. The PHSER is a sort of audit including interviews, site visit and document review and verification, PHSER is guided by a questioner checklist (Companies to develop) of this document and taking benefit from the previous experience of the persons around the table.

vi. The PHSER should address the HSE aspects at the different stages of the life cycle of the project, from FEED to pre-startup stage. In certain cases, PHSER should be conducted for Post-operation and abandonment stages. The PHSER recommendations from one phase should be closed prior to initiate for next PHSER stage.

vii. PHSER in addition to Pre startup safety review/ ready for startup, which check for readiness of system for introduction of hydrocarbon/ energy source.

Refer Informative Annexure 16: Details PHSER objectives for various phases and Informative Annexure 17: Typical checklist of HSE deliverable.

8.0 VERIFY

8.1 Pre-startup Safety Review (PSSR)

One of the most critical periods in an operation is the startup of the process. Before a new or modified facility/ installation is started, a systematic check should be made to ensure that the equipment has been installed properly, operating procedures have been reviewed, items needing attention from PHA's have been resolved and personnel have been trained.

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8.1.1 The prestart-up safety review provides a final check of new and/ modified process/ equipment to confirm that all appropriate elements of the Safety Management system have been addressed satisfactorily, and the facility is safe to operate.

8.1.2 The main purpose of the review is to reduce the chance of some requirement being overlooked that could create a hazard or introduce unexpected safety problem as process is brought to normal operating conditions.

8.1.3 Organization should develop and establish procedure of Pre Startup Safety Review, that should confirm the following:

(a) All requisite statutory and legal compliances, approvals, consents, NOC, clearances are in place.

(b) Integrity and the essential safety systems have been installed (/reinstated) and tested as below (but not limited to):

i. Safety Critical Equipment such as PSV, TSV, Gas detectors, H2S detectors, Fire alarms, Smoke/ Heat detectors, firefighting facilities etc.

ii. Communication facilities viz. CCTVs, Call stations, PA system, telephones etc.

iii. Safety instrumentations such as safety interlock (cause and effect), DCS, Alarms etc.

(c) Construction is in accordance with design specifications, such as:

i. Material of construction,

ii. Direction of NRVs, Orifices

iii. Gasket, stud, Fasteners

iv. Position of isolation valves, Blinds, Drain, Vents, Supports etc. in accordance with the P&ID

v. Direction/ stroke checking/ fail safe action of all the control valves/ SDVs in accordance with the P&ID etc.

(d) For new facilities and modifications, Process Hazard Analysis (PHA) is performed and recommendations have been resolved or implemented before startup;

(e) To ensure site modifications during construction phase have been properly controlled, approved and records updated. (Refer Informative Annexure 4: General document control features)

(f) Operating, maintenance and emergency procedures are in place and are adequate.

(g) For new project, commissioning procedure for the facilities with responsibility matrix are in place and are adequate.

(h) Liquidation of all pending points/ recommendations of PCSA, Internal Audit checklists, HIRA, QRA, HAZOP, Licensors checklist, P&ID note(s), P&ID review, 3D model review (as applicable) should be ensured. Compliance with the same should be authenticated & approved for acceptance.

(i) To ensure training of each employee involved in the operating process is complete.

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8.1.4 Pre Startup Safety Review should be conducted prior to:

(a) Commissioning of newly constructed facilities (minor or major project).

(b) Startup of facility/ installation after revamp/ shutdown/ turnaround (when the integrity of facilities, installation and equipment has been disturbed as a part of revamp/ shutdown/ turnaround)

(c) Commissioning/ startup of facilities which have undergone significant alteration, modification; permanent or temporary, via Management of change procedure (for modified facilities when the modification is significant enough to require a change in the process safety information).

(d) Startup of hired or temporary facilities.

(e) Startup post soft changes in control systems (e.g. DCS/ESD).

(f) Startup after prolonged shutdown (e.g. Mothballed/ preserved/ idle facility/ installation)

8.1.5 The pre startup safety review should be conducted by a multidisciplinary team which includes representation from operations, design, process engineering & maintenance and process safety expertise/ HSE etc.

8.1.6 An appropriate prestart-up checklist(s) relevant to the particular process/ equipment should be developed and used.

8.1.7 The PSSR should be documented, signed by each member of the review team. A system should be established and controlled to ensure that the PSSR recommendations are closed in time bound manner and properly documented.

8.2 SAFETY MANAGEMENT SYSTEM AUDIT

Safety Management System Audit is a compliance audit that helps in the identification of vulnerable areas, risks & hazards, and opportunities for improvement. It enables an organization to provide a safe and healthy workplace, prevent work-related injury & ill health, and continually improve its HSE performance. It also gives an idea about how effectively the Safety Management System is implemented and how its objectives are being accomplished.

It is the feedback mechanism that provides management with the status and measurement of effectiveness of the various elements and activities of SMS and leads to the appropriate control over these efforts.

The organizations should establish and maintain an audit program and procedures for the periodic audit of the Safety Management System. The audit program and procedures should cover:

(a) The activities and areas to be considered in audit.

(b) The frequency of audit

(c) Composition of audit team

(d) Audit process

(e) Audit Reporting

Sufficient resources should be committed by management to the audit in order to meet its intended scope.

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8.2.1 Safety Management System Audits are undertaken to meet the different specific objectives viz.-

(a) To check whether the organization conforms to its established HSE policy and requirements.

(b) To determine the adequacy and effectiveness of the Safety Management System.

(c) To identify any deficiencies in the Layout, Construction and Design which might have cropped up during the addition and modification of facilities.

(d) To ensure fire protection facilities and safety systems are well maintained.

(e) To ensure that operating and maintenance procedures are in line with established manuals and Standard Operating Procedures.

(f) To check the effectiveness of emergency preparedness and response.

(g) To check the compliance of applicable statutory/ legal requirements like statutes and regulations, permits, licenses, etc., and other requirements like standards and guidelines, codes of practice, technical specifications, OISD standards.

(h) To review the existing assessment of risks and hazards and adequacy of mitigation measures implemented.

(i) To determine the adequacy and effectiveness of the Incident Management System.

8.2.2 Types of Safety Management System Audit: Following two types of Safety Management System audit should be carried out:

(a) Internal Safety Audit

(b) External Safety Audit

8.2.3 INTERNAL SAFETY AUDIT

Internal audits, also known as first-party audits, are conducted by the employees of the same organization. Internal Safety Audits should be carried out through multidisciplinary team(s) consisting of experienced officers from various disciplines viz. Operations, Maintenance & Inspection, and HSE.

(a) All oil and gas installations including E&P, processing, storage, handling and transportation facilities should be audited once a year.

(b) A calendar containing the area, names of auditors and period of audit should be prepared for every calendar year in advance and circulated to all the departments and concerned officers.

(c) Areas to be audited should be logically grouped based on functions.

(d) The audit team should review the effectiveness of Safety Management System through implementation status of recommendations of internal and external safety audits, risk analysis/ HAZOP studies and high level/ accident inquiry committee recommendations.

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Emergency preparedness, fire protection and prevention system, Standard Operating Procedure (SOP)/ Standing instructions, PPE, Log books, Log sheets, Equipment history cards, Mock drill records, Incident/ Accident records, Minutes of Safety Committee Meetings, Fire Fighting equipment maintenance records, Training records, Preventive maintenance records etc. be checked during the audit.

(e) The duration of the audit should be decided depending upon the area/ location size, type/ complexity of the installation, installed facilities and location management.

(f) Detailed guidelines as given in OISD-STD-145 on 'Internal Safety Audits should be followed.

(g) The work of the Internal Safety Audit shall be presented in the form of a Safety Audit Report which shall contain observations & recommendations and, also, in brief, the modalities adopted in conducting the audit and the names of the audit team members.

(h) Audit report should be submitted to the respective auditee leadership. The auditee shall review the progress of the implementation of recommendations periodically. The auditee should keep the individual(s) managing the audit program informed of the status of these actions at least every quarter. All the action points shall be closed in a time-bound manner. The audit observations not closed within 6 months shall be brought to the notice of the higher management of the organization.

(i) The completion and effectiveness of the corrective actions taken to comply with the recommendations shall be verified in subsequent audits.

8.2.4 EXTERNAL SAFETY AUDIT (ESA)

(a) External audits include those generally called second and third-party audits.

Second-party audits are conducted by parties having an interest in the organization, such as customers or by other individuals on their behalf.

Third-party audits are conducted by independent auditing organizations, such as OISD, PESO, PNGRB, Directorate General of Factory Advice Service and Labour Institutes (DGFASLI), Directorate General of Mines Safety (DGMS) and other regulatory authorities or authorized/ competent independent agencies, who provide certification/ registration of conformity or governmental agencies.

(b) Audit team should review effectiveness of Internal control mechanisms such as internal audits, safety meetings, system of addressing recommendations/ alerts, system for ensuring third party audit compliances, observations raised by regulator, corrective actions based on reporting and investigation of incident, unsafe act/ condition.

(c) The auditee should keep informed the status of the actions/ implementation status to the external auditor at every quarter.

(d) Time bound action plan should be prepared for implementation of the recommendations and the same should be closely monitored at higher management level.

Note: Third party audit should also be carried out at organization level (separately or combined with installation) to review corporate level documents, policies, leadership commitment and culture.

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8.3 MANAGEMENT REVIEW

The Management Review element monitor the near-real-time effectiveness of the Safety Management System, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.

(a) The organization should determine:

i. The committee (Chairperson & other members), frequency of review/ evaluation and agenda including the status of actions from previous management reviews.

ii. Performance parameters/ indicators for measuring the effectiveness of control measures, including indicators of the failure of any control measure, effectiveness of control etc. The results of safety audits, incident investigations etc. acts as inputs for developing leading and lagging indicators.

(A combination of leading and lagging indicators is the best way to provide a complete picture of safety management effectiveness).

iii. The methods for monitoring, measurement, analysis and performance evaluation and reporting

iv. Corrective actions to be taken in the event of failure of controls and in the event of the indicators not meeting performance targets.

(b) In setting performance standards/ parameter/ criterion, organization should consider the following questions:

i. How will I know that this particular SMS element is working effectively?

ii. Alternatively, what will tell me that the element is not working?

(c) The performance evaluation should also include the parameters like compliance of legal requirement, compliance of environment monitoring, compliance against occupational health monitoring, compliance of actions against the identified hazards, risk, opportunities for continual improvement, gaps and results of previous evaluations etc. in addition to those related to Safety Management System.

Note: Organizations may develop Annual performance management sheets on the basis of criterion/ performance standards/ parameter decided by organization for ease of monitoring and control. (Refer Annexure 18: Specimen performance management sheet).

Typical Criterion/ performance standards/ parameters (Refer Annexure 19) should be monitored and measured to evaluate the performance of elements of SMS (but not limited to).

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9.0 REFERENCES

OISD standards/ Guidelines and Recommended Practices	
OISD-STD-105	Work Permit System
OISD-STD-114	Safe Handling of Hazardous Chemicals
OISD-STD-128	Inspection of Unfired Pressure Vessels
OISD-STD-139	Design, Construction, Inspection & Maintenance of Offshore Pipelines and Facilities & Requirements Of Deep Water Pipelines
OISD-STD-140	Inspection of jetty pipelines
OISD-STD-141	Design and Construction requirements for cross country liquid hydrocarbon pipelines
OISD-STD-145	Internal Safety Audits
OISD-STD-151	Safety in Design, Fabrication and Fittings Propane Tank Trucks
OISD-STD-152	Safety Instrumentation for Process System in Hydrocarbon Industry
OISD-STD-154	Safety aspects in Functional Training
OISD-STD-155	Personal Protective Equipment
OISD-RP-157	Safety in Transportation of Bulk Petroleum Products (Rail and Road)
OISD-RP-158	Recommended Practices on Storage and Handling of Bulk Liquefied Petroleum Gas
OISD-STD-159	LPG Tank Trucks - Requirements of Safety on Design/Fabrication & Fittings
OISD-GDN-161	LPG Tank Truck Incidents Rescue & Relief Operations
OISD-GDN-165	Guidelines for Rescue & Relief Operations for POL Tank Truck Accident
OISD-GDN-166	Guidelines for Occupational Health Monitoring in Oil and Gas Industry
OISD-RP-167	POL Tank lorry Design & Safety
OISD-GDN-168	Emergency Preparedness Plan for Marketing Locations of Oil Industry
OISD-STD-171	Preservation of Idle Static & Rotary Mechanical Equipment
OISD-STD-176	Safety Health & Environment Training for Exploration & Production (Upstream) Personnel
OISD-GDN-178	Guidelines on Management of Change
OISD-STD-188	Corrosion Monitoring and Control of Offshore & Onshore Pipelines
OISD-GDN-197	Guidelines for Environmental Impact Assessment
OISD-GDN-204	Medical Requirements, Emergency Evacuation and Facilities (for Upstream)
OISD-GDN-207	Contractor Safety
OISD-STD-214	Cross Country LPG Pipelines
OISD-STD-226	Natural Gas Transmission Pipelines and City Gas Distribution Networks
OISD-GDN-227	Emergency Response and Preparedness in E&P Industry
OISD-GDN-228	Selection, Training & Placement of Fire Operators in Hydrocarbon & Petrochemical Industry
OISD-GDN-233	Guidelines on inspection of non-piggable pipelines.

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OISD-STD-245	Standard on safety for LNG bunkering facilities at ports for large ships, coastal shipping and inland water transport (IWT) terminals
National/ international standards	
PNGRB T4S (Petroleum Installations)	Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Regulations, 2020. (as amended)
PNGRB ERDMP	Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan) (as amended)
MoP&NG DMP	Disaster Management Plan (DMP) 2021, Government of India Ministry of Petroleum & Natural Gas, revised in September 2021
IS 14489	Code of practice on occupational safety and health audit
IS 15656	Hazard Identification and Risk Analysis – Code of Practice
OSHA 29 CFR 1910.119	Occupational Safety and Health Administration (OSHA) OSHA Rule for Process Safety Management of Highly Hazardous Chemicals
API RP 75 4th Edition, December 2019	Safety and Environmental Management System for Offshore Operations and Assets
API RP 754, Version 3.1	Guide to reporting Process Safety Events
API RP 76 2nd Edition, November 2007 Reaffirmation Notice, January 2013	Contractor Safety Management for Oil and Gas Drilling and Production Operations Includes all amendments and changes through
API 14J Reaffirmation Notice , September 2019	Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities
ISO 14224 3rd Edition, September 15, 2016	Petroleum, petrochemical and natural gas industries - Collection and exchange of reliability and maintenance data for equipment Petroleum, petrochemical and natural gas industries - Collection and exchange of reliability and maintenance data for equipment
ISO 17776:2016	Petroleum and natural gas industries — Offshore production installations — Major accident hazard management during the design of new installations
ISO 19011 3rd Edition, July 1, 2018	Guidelines for auditing management systems
ISO 45001 1st Edition, March 2018	Occupational health and safety management systems - Requirements with guidance for use
ISO 55001 1st Edition, January 15, 2014	Asset management - Management systems - Requirements
National Institute of Public Health and the Environment (RIVM) Centre for External Safety, Netherlands	Reference Manual Bevi Risk Assessments version 3.2 (Purple Book)

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IOGP	A guide to selecting appropriate tools to improve HSE culture
EEMUA	Engineering Equipment & Materials Users' Association guidline-192
FAA	Safety Management System (SMS) policy and requirements, Federal Aviation Administration (FAA).
WAC 296-901-14028 Appendix D-Safety Data Sheets	Washington State Department Of Labor & Industries Hazard Communication Standard
CCPS	Guidelines for Writing Effective Operating and Maintenance Procedures
Wiley	Guidelines for Engineering Design for Process Safety, Second Edition
Wiley	Guidelines for Risk Based Process Safety
CCPS	Guidelines for Asset Integrity Management
UK HSE	

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10.0 ABBREVIATIONS

AFC	Approved for Construction
AIM	Asset Integrity Management
ALARP	As Low As Reasonably Practicable
API	American Petroleum Institute
BFD	Block Flow Diagram
CA	Compliance Audit
CAPA	Corrective and Preventive Actions
CCOE	Chief Controller of Explosives
CCPS	Centre for Chemical Process Safety
CMV	Central Motor Vehicles (Rules)
COMAH	Control of Major Accident Hazards
DCP	Dry Chemical Powder
DCS	Distributed Control System
DGFASLI	Directorate General of Factory Advice Service & Labour Institutes
DGMS	Directorate General of Mines Safety
DMP	Disaster Management Plan
EEMUA	Engineering Equipment and Materials Users Association
EER	Evacuation, Escape and Rescue
EIA	Environmental Impact Assessment
EOT	Electric Overhead Travelling (Crane)
E&P	Exploration & Production
EPC	Engineering, Procurement and Construction
ERDMP	Emergency Response and Disaster Management Plan
ERV	Emergency Response Vehicle
ESA	External Safety Audit
ESD	Emergency Shutdown System
FAA	Federal Aviation Administration
FEED	Front End Engineering Design
GHS	Globally Harmonized System
HAZAN	Hazard Analysis
HAZCHEM	Hazardous chemicals
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HIA	Health Impact Assessment
HIPS	High Integrity Protection System
HIRA	Hazard Identification & Risk Analysis
HOT	Hoist One Track (Crane)
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security, Environment
IDLH	Immediately Dangerous to Life and Health

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IOGP	International Association of Oil & Gas Producers
IS	Indian Standards
ISA	Internal Safety Audit
ISO	International Organization for Standardization
ITPM	Inspection Testing & Preventive Maintenance
IVMS	In-vehicle monitoring system
JSA	Job Safety Analysis
KPI	Key Performance Indicator
LEL	Lower Explosive Limit
LFI	Learning from Incidents
LFL	Lower Flammability Limit
LNG	Liquefied Natural Gas
LOPC	Loss of Primary Containment
LOTO	Lock-Out/ Tag-Out
LPG	Liquefied Petroleum Gas
MAH	Major Accident Hazards
MCP	Manual Call Point
MSIHC	Manufacture, Storage and Import of Hazardous Chemicals (Rules)
MI	Mechanical Integrity
MMC	Man-Management Contract
MOC	Management of Change
SDS	Safety Data Sheet
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
O&M	Operation & Maintenance
OIC	Officer In-charge
OISD	Oil Industry Safety Directorate
OMS	Operating Management System
OSHA	Occupational Safety and Health Administration
P&ID	Piping and instrument diagrams
PCSA	Pre-Commissioning Safety Audit
PESO	Petroleum & Explosive Safety Organisation
PFD	Process Flow Diagram
PHA	Process Hazard Analysis
PHR	Process Hazard Review
PHSER	Project HSE Reviews
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PNGRB	Petroleum & Natural Gas Regulatory Board
POL	Petroleum, Oil and Lubricants
PPE	Personal Protective Equipment
PSI	Process Safety Information

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PSM	Process Safety Management
PSSR	Pre Start-up Safety Reviews
PSV	Pressure Safety (Relief) Valve
QCBS	Quality and Cost Based Sourcing
QRA	Quantitative Risk Assessment/ Analysis
RAGAGEP	Recognized and Generally Accepted Good Engineering Practices
RCA	Root Cause Analysis
RRP	Risk Ranking Points
SIL	Safety Integrity Level
SIMOPS	Simultaneous Operations
SLD	Single-Line Diagrams
SMP	Standard Maintenance Procedures
SMPV	Static & Mobile Pressure Vessels (Rules)
SMS	Safety Management System
SOP	Standard Operating Procedure
STD	Standard
SWP	Safe Working Procedure
TBT	Tool Box Talk
TREM	Transport Emergency (card)
TSV	Thermal Relief Valve
UV	Ultra-Violet
VHF	Very High Frequency
VTS	Vehicle Tracking System

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11.0 ANNEXURE

Annexure 1: Definition of major accident as per DMP 2021, GOI, MoPNG

An incident should be treated as Major if any of the following occurs

(a) Any incident of fire not extinguished in 15 minutes.

(b) Any incident on account of explosion/ blowout/ radioactive (leakage or loss).

(c) Any incident causing shutdown of operation(s) for more than eight hours.

(d) Any incident causing financial loss above Rs. 50 lakhs.

(e) Any incident within unit/ installation premises leads to fatality(s).

(f) Any incident within unit/ installation premises, leading to permanent loss of body part and/ or permanent disability.

(g) Any incident causing major loss of containment and having adverse impact outside the installation/ location premises including disaster defined under Section 2 (d) of DMP Act 2005.

(h) Cumulative lost time, due to incident (within unit/ installation premises) is more than 45 man-days.

(i) Any incident of road accidents (during transportation of petroleum products) resulting in fire/ explosions which in turn leads to fatality(s).

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Annexure 2: Detail description of commonly used techniques to aid in hazard identification and qualitative analysis (Informative)

Checklist

(a) A checklist is commonly used to verify compliance with minimal standards and to identify areas that require further evaluation. A checklist is easy to use and can be used during any stage of a project life cycle (design, construction, startup, operation, and shutdown).

(b) A checklist is a convenient means of communicating the minimal acceptable level of hazard evaluation that is required for any job. The checklist is prepared by experienced personnel familiar with the design and operation of the facilities and with company and industry standards and procedures. Once the checklist has been prepared, it can then be applied by less experienced personnel.

(c) Checklists are limited by the experience of the authors and diligence of the users. Checklists should be audited and updated regularly to incorporate new experience by the company and industry, including the results of accident and incident investigations. A checklist can be as detailed as necessary to satisfy the specific situation, and it should be applied conscientiously in order to evaluate whether standard procedures are being followed and to identify problems that require further attention.

(d) A checklist is generally the quickest and easiest method of hazards analysis and is very effective for control of standard hazards. Checklists provide a guide to the evaluator of items to be considered in performing the hazards evaluation. The actual procedure by which these items are considered and the manner in which it is documented that they have been considered can vary widely and are at the discretion of the operator.

“What If” Analysis

(a) The “what if” procedure is an unstructured method for considering the results of unexpected events that could lead to an undesirable result. This method uses questions that begin with “what if...” For example, consider a condensate barge loading operation:

i. What if the loading pump fails to shut down?

ii. What if the shutdown valve fails to close?

iii. What if the high-level alarm on the barge fails?

iv. What if barge personnel ignore the high-level alarm?

v. What if the barge drifts off location while loading?

(b) This method is not overly concerned with how the “what if” situation develops.

For example, above it is postulated that the barge high-level alarm can fail, but its exact mode of failure is not important to this analysis. The analysis team should be careful not to become unrealistic and begin postulating unlikely scenarios. The questions should be realistic and be seriously investigated. The questions should be based on the previous experience of the analysis team and will vary for each process system. The analysis is only as good as the analysis team is experienced.

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(c) The "what if" analysis can be applied to the design, modification or operation phase of a facility. Data utilized may include process flow diagrams, P&IDs, layout drawing and operating procedures.

(d) The result is a list of problem areas that potentially lead to accidents and suggested methods/ changes for preventing or mitigating the accidents. Frequently the "what if" analysis is combined with the checklist technique. This is referred to as the "what if - checklist" method.

Hazard and Operability (HAZOP) Study

(a) The HAZOP technique was developed to identify hazards in all types of process/plants/ facilities, including offshore platform facilities, and to identify problem areas regarding the operability of the facility.

(b) A HAZOP study uses a multi-disciplinary team that works together to identify hazards and operability problems using a formal, structured form of the "what if" analysis.

(c) The team leader should be experienced in the HAZOP technique in order to guide the team through the analysis with "guide words" and "process parameters." The team normally consists of five to seven engineering, operations, and health, safety, and environmental staff depending on the size and complexity of the facility.

(d) The team members should be very knowledgeable about the process, equipment and operations. The guide words and process parameters are applied at "study nodes" (i.e., specific lines or locations) in the facility to identify potential problems at those nodes. For example, the guide word "high" combined with the process parameter "level" results in questions concerning possible "high level" deviations from design intent.

(e) The team analyzes the effects of any deviations at the point in question (study node) and determines possible causes for the deviation (e.g., operator inadvertently opens valve and barge overflows into the water). If the causes, probabilities and consequences are realistic and significant, they are recorded so that further actions can be taken outside the HAZOP study.

(f) This method can be used during design, modification or operation of a facility. It is particularly useful during the detailed design phase, after P&IDs are complete. It produces a list of problem areas that could lead to potential hazards or operability problems, and a list of recommended changes, suggestions or actions to improve safety or operability.

(g) Requirements include a complete set of process flow diagrams, P&IDs, plot plans, equipment layouts and operating procedures. Time requirements and effectiveness are directly related to the size and complexity of the facility and the experience of the team. Generally, HAZOP is a time-consuming method.

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Failure Modes and Effects Analysis (FMEA)

(a) FMEA is a tabulation of facility equipment items, their potential failure modes, and the effects of these failures on the equipment or facility.

(b) The failure mode is simply a description of what caused the equipment to fail. The effect is the accident, consequence or system response to the failure.

(c) The FMEA identifies single failure modes that can cause or contribute to the cause of- an accident.

(d) The FMEA is not useful for identifying combinations of failures that can lead to accidents. The FMEA may be used in conjunction with other hazard identification techniques such as HAZOP for special investigations such as critical or complex instrumentation systems.

(e) The purpose of FMEA is to identify equipment failure modes and the effect of each failure mode on the process system.

(f) In the design phase, FMEA can be used to identify the need for additional protective systems or redundancy. During facility modifications, FMEA can be used to identify the effects of field modifications to existing equipment.

(g) The FMEA is also useful during operation to identify single failures that could result in significant accidents.

(h) Because FMEAs are subjective, the technique requires at least two analysts who are familiar with the process and the equipment.

(i) The analysts may change from one section of a facility to another. A “failure modes, effects, and criticality analysis” (FMECA) is the same as an FMEA except that the relative ranking (criticality) of each failure mode is included in the analysis.

Fault Tree Analysis (FTA)

(a) FTA is a deductive technique that focuses on one particular accident event, often called a top event, and then constructs a logic diagram of all conceivable event sequences (both mechanical and human) which could lead to that accident event.

(b) The fault tree is a graphic illustration of various combinations of equipment faults, failures and human errors that could result in an accident.

(c) As a qualitative tool, FTA is useful because it breaks an accident down into the basic failures and errors that could cause an accident. It also allows the analyst to determine the effect of changing or adding components to a system; e.g., supplying redundant, independent high-level alarms or shutdowns.

(d) The FTA can be used during design, modification or operation of a facility. It can be especially useful in analyzing new or novel processes for which there is no operating history. The procedure results in a set of logic diagrams that illustrates how certain combinations of failures and/or errors can result in specific accidents.

(e) The results of a FTA are qualitative, but can be made quantitative if failure rate data are available for the failure events.

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(f) Data requirements for FTA include P&IDs, equipment drawings and specifications, operating procedures, knowledge of failure modes, and, where applicable, failure rate data. Normally, one person is assigned to prepare a single fault tree for a given accident. This person should have a thorough knowledge of the facility processes. The preparation of fault trees can be very time consuming for large or complex facilities.

Other Methods

(a) There are many other hazards analysis methods available and in use by industry. They include methods such as Event Tree Analysis, Cause Consequence Analysis, and Human Error Analysis. They vary in purpose, nature of results, manpower requirements, and time and cost requirements. For more in-depth study of other hazard evaluation procedures refer to "Guidelines for Hazard Evaluation Procedures" by the Center for Chemical Process Safety (CCPS).

(Reference: API-RP-14J)

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Annexure 3: Basic steps of QRA, Individual and societal risk and ALARP level/ Tolerable limit values

Basic steps of QRA study

Key steps involved in a QRA study are Hazard identification, consequence analysis, frequency estimation, risk analysis and assessment.

(a) QRA methodology and Assumption register in line with this QRA procedure to be prepared.

(b) Hazard Identification includes identifying sources of process accidents involving release of hazardous materials in the atmosphere, and the various scenarios that could occur. Past process hazard analysis studies (including HAZOP reports), incident history, equipment and piping in the facility screened by relative ranking methods like Dow indices are utilized in this process. Scenarios are developed with representative input process operating and design data for analysis in QRA.

(c) Consequence Analysis is then performed on the identified scenarios to estimate the probable zone of impact of release scenarios that can harm human beings, installation equipment and other structures.

(d) Frequency estimation shall be based on published literature/ organizational data (if available). Alternately, frequency estimation may be carried out through part count (flanges, valve etc.) in isolatable sections. Various other factors that are included in frequency estimates are probability of ignition, personnel occupancy, wind direction, etc. which are determined for the study.

(e) Risk analysis is then performed to evaluate the scenarios against the set tolerable/ acceptable risk criterion and recommendations provided for further risk mitigation. Various risk mitigation options generated out of a QRA study typically focus on impact reduction, i.e., relocating or protecting occupied facilities, inventory reduction, substitution with less hazardous materials, active or passive fire protection systems, rapid de-inventorying systems etc.

(f) Individual risks & Societal Risks should be estimated with the plotting of FN curve to assess the levels of Safety Risks from operation of the facility. These parameters should be utilized to bring down Risks in the facility to ALARP level.

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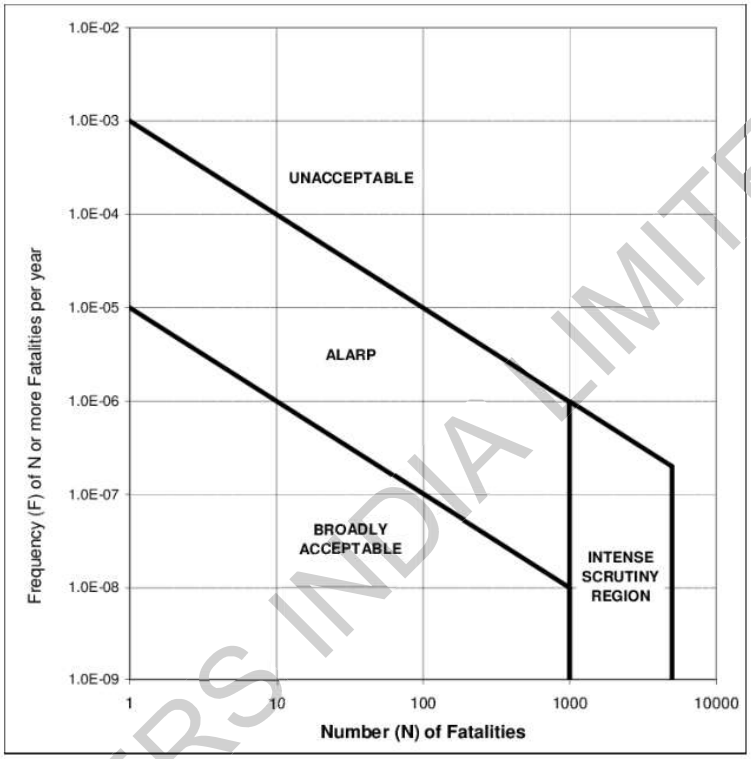
A typical F/N curve is provided below. Corporation may develop F/N curve for their organization.



F-N Curve for Evaluating Societal Risk

(g) ALARP level/ Tolerable risk limit should be in the range of 10^{-6} to 10^{-3} for worker and 10^{-6} to 10^{-4} for public risk or stringent benchmarked with internationally acceptable data.

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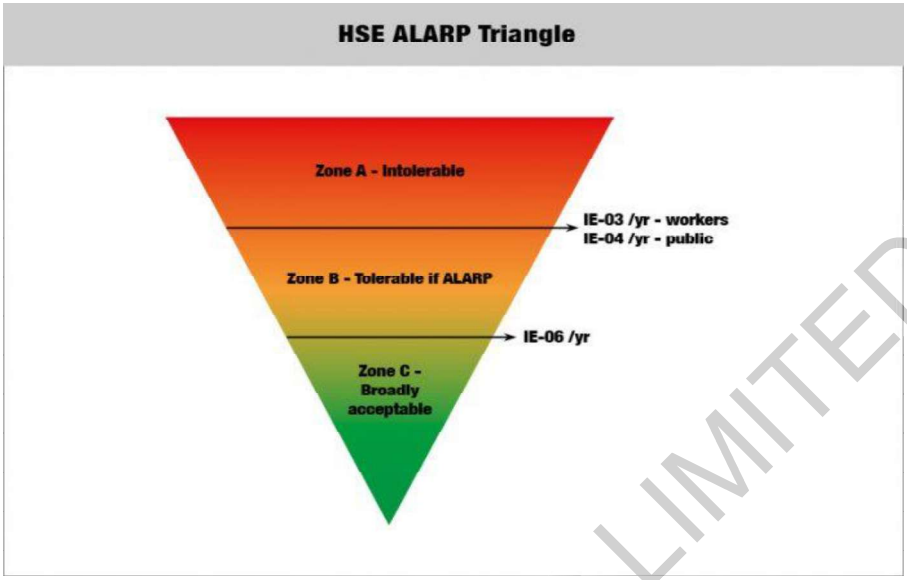

(h) Many advanced software models are available to perform QRA studies to maintain the accuracy in the quantitative estimates. It should be noted that while there are tools available in the industry for QRA, there is also a fair amount of judgement involved in these studies and hence should be performed by competent analysts only.

(i) The study methodology followed the standard risk assessment steps outlined below. Figure1 presents a flow chart of the QRA steps followed.

Note: Quantitative Risk Analysis (QRA) should be done in line with IS 15656: Hazard Identification and Risk Analysis – Code of Practice, Reference Manual Bevi Risk Assessments version 3.2 (Purple Book) and equivalent national/ international standard.

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Informative Annexure 4: General document control features

(a) Regardless of the chosen format, the document template should include document control features (typically in a header or footer) to ensure that the workforce always have the current version of a procedure.

(b) The following aspects should be taken into account for control of documents:

i. The document control features usually include some combination of the following (whichever applicable):

- Document number;
- Revision number;
- Revision date;
- Date printed;
- Copy number;
- Page numbers;
- End-of-document marker;
- "Controlled Document" indicator;
- Preparation/ Review/ Approval.

ii. Approval /authentication procedure for adequacy prior to use

iii. Roles and Responsibility (Custodian/ Preparation/ Review/ approval/ updation& Re-approval/ distribution etc.)

iv. Documented procedure for retention, disposition and updation,

v. Accessibility (e.g., who can view/ who can change),

vi. Management of external documents and their distribution

vii. Procedure to prevent obsolete documents from unintended use (Auditing mechanisms should be implemented to search out and destroy uncontrolled copies)

viii. Management of change/ Records of changes (Revision history sheet with revision number and details of changes done)

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Annexure 5: Typical contents of an operating manual of a process installation (Informative)

Typical contents of an operating manual of a process installation

I. Introduction

II. Design Basis

A) Installation Design, Normal and Turn Down Capacity
B) Feed Characteristics
C) Product (and By-Product) Specifications
D) Utility Conditions
E) Heat and Material Balance Tables
F) Utility Summary Tables
G) Effluent Summary

III. Process Description

A) Nature of Process
B) Process of Flow

IV. Operating Variables and Controls

A) Control Points
B) Effect of Operating Variables
C) Troubleshooting Guide

V. Auxiliary Systems

VI. Equipment Operation

A) Pumps and Compressors
B) Exchangers
C) Fired Heaters
D) Vessels and Reactors
E) Package Units

VII. Instrumentation and Control

A) General
B) Advanced Control Systems and Optimization
C) Setting Point List

VIII Standard Operating Procedures

A. Initial Start-Up Preparation

A.1 Installation inspection after completion of mechanical side
A.1.1 Field checking
A.1.2 Commissioning of utilities
A.1.3 Mechanical running test of rotary machinery
A.2 Cleaning and washing of piping system
A.3 Heater inspection and dry-out
A.4 System drying
A.5 Chemical cleaning and preparation of chemicals

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A.6 Catalyst loading
A.7 Leakage and pressure test
A.8 Purging air with Nitrogen
B. Initial Start-Up Procedure
B.1 General
B.2 Prepare Units for Charging
B.3 Steam Out and Purge
B.4 Pressurize Systems
B.5 Reduction and Activation of Catalyst
B.6 Establish Gas Circulation Through Catalytic Reactor Sections
B.7 Feed in and Circulation
B.8 Heating up of Installation
B.9 Establish Operation
B.10 Start Chemical Injection
B.11 Line Out
C. Normal Start-Up Procedure
C.1 General
C.2 Re-Start-Up After Short Shut-Down Duration (Hot Start)
C.3 Re-Start-Up After Long Shut-Down Duration (Cold Start)

IX Normal Operation
A. General
B. Normal Operating Conditions
C. Check Points and Adjustments
D. Reduced Operation

X Normal Shut-Down Procedure
A. General
B. Load Down
C. Shut-Down Procedure

XI Emergency Shut-Down Procedure
A. General
B. Safeguarding Systems and Equipment
B.1 Trip Sequence System
B.2 Safety Relief Valves Load Summary Table
C. Causes of Emergency Shutdown
C.1 Feed Failure
C.2 Power Failure
C.3 Steam Failure
C.4 Cooling Water Failure
C.5 Instrument Air Failure
C.6 Fuel Failure
C.7 Machine (Mechanical) Failure
C.8 Explosion, Fire, Line Rupture, Serious Leaks
C.9 Other Faults and Failures

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XII Miscellaneous Procedures

A. Catalyst Oxidation
B. Catalyst Regeneration
C. Catalyst Unloading
D. Decoking
E. Neutralization

XIII Safety

A. General
B. List of chemicals & properties
C. Storage capacity
D. Storage conditions
E. Fire-Fighting Equipment
F. List of Safety Critical Equipment

XIV Analytical Tests

XV Catalysts, Chemicals and Packings

XVI Drawings

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Informative Annexure 6: Critical activities which may be supplemented by safe work practices and work permits

(a) Safe isolation of process equipment[5]

(b) Line breaking/ opening of process equipment

(c) Lifting operation over process equipment

(d) Use of heavy construction equipment in process area

(e) Hot tapping

(f) Simultaneous Operations

(g) Explosive / blasting operation

(h) Management of highly hazardous material and chemicals. (Chlorine, H_2S, Radiation source etc.)

(i) Fire system impairment/ Non availability of safety critical equipment.

(j) Temporary isolation of relief devices

(k) On line sealing in hazardous services

(l) Access to process area by unauthorised personnel

(m) Activities specific to E&P Industry

- Marine Operations
- Boat handling
- Helicopter handling
- Working over and near water
- Perforation operation
- Diving

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[5] *Refer UK HSE guideline – HSG253*

Informative Annexure 7: Specimen template for declaration by contract employer (contractor)

Declaration

CONTRACTOR SAFETY TRAINING - _____ (Name of the organization)

DECLARATION FORM
Description of Work Order &No: _____
Location: _____
Contractor Name: _____ **Co. Phone:** _____
Start Date: _____ **Completion**: _____
Description of Work: _____
_____

I have received, read, and understood the requirements as specified in the written Contractor Safety Program/ Bridging document of _____ **(Name of the organization)** and applicable government regulations. All the representatives of my company and I have undergone the "HSE Awareness" training course and have understood the following,

1. Organization's Environmental, Health and Safety policies.
2. Emergency procedures for the installation and site.
3. Procedure for internal and external transport.
4. The hazards of chemicals in the areas of anticipated work and requirements of PPEs.
5. Fire safety requirements of the office provided at site during the stay.
6. Communication protocol.

On Behalf of M/s _____ *(*name of the contractor's company*), we declare that all representatives of*_____ *should adhere to it.*

Name & Signature
(Representative of contractor's company)

Date

Location

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Annexure 8: Sample showing key elements of bridging document (Informative)

The bridging document for Health, Safety & Environment Management System should include the following

1. Contract Number & Date
2. Operator/ Organization
3. Contractor
4. Installation
5. Table of Content of the bridgingdocument shall include(s)

A. Introduction

B. Purpose – With specific objectives

C. Document Control Procedure

   i. Document Control

   ii. Amendment and Re-issue

   iii. Document holder responsibility

D. Organogram

E. Responsibilities and Accountabilities

   i. Operator

   ii. Contractor

F. Communication

   i. Communication interfaces

   ii. Reporting

   iii. Emergency Communication

   iv. Communication to Regulatory Entities

G. Management of Change

H. Work Programmes & Procedures

   i. General

   ii. HSE Procedures

   iii. Manning and Work Programme Execution

   iv. Simultaneous Operations (SIMOPS), if applicable

   v. Occupational Health

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I. Emergency Response Procedures
   i. Procedures
   ii. General Emergency
   iii. Oil Spill communications, if applicable
   iv. Drills and Exercises
   v. Emergency Response Arrangements

J. Environment Management Plan
   i. Waste Management Plan
   ii. Operational discharge Management

K. Equipment : Fitness for purpose
   i. Equipment
   ii. Operational Procedure
   iii. Maintenance Procedure
   iv. Modification Procedure
   v. Materials and Spare Management
   vi. Verification Arrangements

L. Personnel, Selection, Competency & Training
   i. Manpower Levels
   ii. Competency
   iii. Selection
   iv. Training

M. Monitoring, Auditing & Review
   i. Monitoring
   ii. Legal Compliance
   iii. Auditing
   iv. Performance Review
   v. Incident reporting & investigation
   vi. RACI chart

N. Declaration of Agreement

This is only a indicative list. Installation may include other aspects as per the locational requirements.

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Informative Annexure 9: General Guidelines for developing Shift handover/ take over procedure and recording information in logs.

A.11.1. Shift Handing Over, Taking over

An effective shift handover is essential to minimize the risk of miscommunication or lack of coordination during continuous operations or work activities. It is the accurate and reliable communication of task-relevant information across shift changes.

(a) Written communication between work groups should be ensured to minimize the potential for misunderstanding. Structured hand over System such as log books, pre-shift briefing/meetings, work instructions, standing instructions should be developed to formalize communications between shifts.

(b) Logs should be established for each key operating position, and written guidance or a standard form for recording information should be developed.

(c) The logs must be a controlled document; recorded in a timely manner and the entries must be legible. Records of the same should be maintained. (Refer Informative Annexure 4: General document control features)

(d) If an error is made, a standard method for corrections should be determined that does not obliterate the erroneous entry.

(e) At shift change, the outgoing shift should brief the incoming shift, in addition to noting its final entry and transferring the written logs to them.

(f) Supervisors should periodically review the logs for accuracy and completeness to emphasize their importance – both for inter-shift communication and for building a useful database of performance information.

A.11.2. Shift Handover Briefing

(a) Time should be allotted in shift schedules to allow sufficient overlap of outgoing and incoming shift personnel to keep from rushing the shift handover process.

(b) Handover should be held at the workplace in an area with minimum distractions.

(c) Handover should be a two way face to face verbal communication with supporting written documentation in the form of shift handover logs.

(d) A review of permitted activities should be conducted so that permit conditions, risk assessments and control measures are understood.

(e) If any incoming operations shift personnel have been away from work for vacation, training, sick leave or other reason, the incoming personnel should review previous shift handover logs that were missed.

(f) Job site inspection and cross checking of shift handover information

(g) Incoming shift personnel should perform routine work area inspections at the beginning of their shift takeover to verify understanding and confirm handover information (outgoing shift personnel do not have to remain on site).

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(h) Re-appraisal of site conditions and control measures should be performed by the incoming shift personnel for any ongoing work or work to be re-commenced on incoming shift.

A.11.3. Shift Handover Logs:

Shift handover logs should be created to meet the particular needs of each location. Some of the suggested points which should be mentioned in log book are as follows:

(a) Status of emergency equipment / systems

(b) Health, Safety, Security, Environmental (HSSE) incidents or issues

(c) Simultaneous Operations (SIMOPS)

(d) Review of any installation / equipment / process changes initiated during the shift) that must be reviewed by the incoming shift.

(e) Production / operational status of installation including:

i. Critical parameter

ii. Status of all isolations overrides and alarm suppressions in place, e.g., Lock Out/Tag Outs, Pressure Safety Valves blocked in, non-availability of safety critical equipment.

iii. Operational instructions received from supervisor / manager

iv. Details of any abnormal operation / alternate operating modes

v. Significant changes in unit operating mode made during the shift (including reasons for change)

vi. Significant changes in unit operating mode required during the next shift (including reasons)

vii. Equipment availability, e.g., equipment breakdowns, out of service.

viii. Current and planned maintenance and construction activity

ix. List and status of permitted maintenance or construction work completed during the shift and /or continuing across shift change.

x. Any incident/ near miss/ unsafe act/unsafe situation happened during the shift

xi. Any re-appraisal of site conditions and control measures needed for ongoing work or work to be re-commenced on incoming shift. A re-appraisal should take place before the incoming shift begins work.

xii. Proper Logging of various activities during shutdown/startup is very critical. All the activities should be mentioned in detail.

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Annexure 10: A specimen Interlock bypasses procedure and format

This is specimen Interlock Bypass Procedure only. Organization should develop, approve and implement procedure in line with the guidelines mentioned in section 7.6.6 of this document.

Company Name and Logo

Reference No: **Revision No:** **Date:**

Interlock Bypass Procedure

Scope: This Procedure is applicable to: (For e.g.)

All Process Units, Offsite, Storage and Dispatch Facilities

All Power and Utilities operations covering TPS, CGPs, Electrical Substations, Cooling Towers etc.

CETP operations.

Delegation of Authority: (for e.g.)

Please find below delegation of authority for bypassing any Process and Equipment Safety Interlock

(Note: Organization to decide authorities as per their organogram)

Interlock System	Period Of Bypassing	Approving Authority for Respective Unit
Process Safety (Production Operations)	Up To 8 Hrs.	Shift-In-Charge / Prod. Superintendent (Grade A Or B)
	< 24 Hrs.	Shift In Charge (Grade C Or D)
	> 24 Hrs. & up to 7 Days	Unit In Charge (Grade D Or E)
	> 7 Days & up to 15 Days	DGM (Operations) Grade F
	> 15 Days & up to One Month	GM (Operations) Grade G
	> One Month & up to Three Months	CGM (Operations) Grade H
	> Three Months	Necessity of the Interlock needs to Be reviewed.**
EQUIPMENT SAFETY (Maintenance/ Mechanical/ Electrical/ Instrumentation)	Up To 8 Hrs.	Zonal Maintenance Engineer
	< 24 Hrs.	Maintenance In-charge
	> 24 Hrs. & up to 7 Days	HOD (Maintenance)
	> 7 Days & up to 15 Days	DGM (Maintenance)
	> 15 Days & up to One Month	GM (Maintenance)

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	> One Month & up to Three Months	CGM (Maintenance)
	> Three Months	Necessity of the Interlock needs to Be reviewed.**

Responsibly: Documentation :(for e.g.)

Unit In Charge (Grade D Or E)

General Guidelines(for e.g.)

(a) All functional heads of Operation Departments should ensure that all the operational/process/ equipment interlocks are always kept in line.

(b) All possible remedial measures I instructions should be taken/ given to protect the equipment/ installation for the period of interlock on bypass mode and also to bring back the interlock in line at the earliest.

(c) A separate interlock bypass register will be maintained by each operation unit / section which will be readily available with shift-in-charge.

(d) The register will contain tag no. of bypassed interlock, tag description, date and time of bypassing the interlock, reasons for bypassing, compensatory measures/ precautions to be taken during the period of interlock bypass and date and time of taking the bypassed interlock back in line along with the signature of the approving authorities as per the delegation of authority.

(e) During the exigencies necessitating bypassing of any safety interlock, the same should be entered in this register and signed by shift-in-charge.

(f) In case of non- availability of designated officer, permission of higher grade officer should be taken.

(g) The list of interlocks on bypass must also be prominently displayed in the control room near the DCS console and the remedial "actions to be taken" must be available with Panel Operator/ Officer. The shift in-charge and panel officer/ operator should record the status of interlocks in their shift log in each shift without fail.

(h) Then any interlock is on bypass mode, the same is to be mentioned by Unit/ Section in charge in the Instruction Book along with alternate safety precautions to be taken / already taken during the interlock bypass period.

(i) In case interlock bypass is being taken due to process/ operational reasons, then approving authority should be from operations only.

(j) In case bypassing is due to maintenance requirements, then concerned maintenance authority is required to countersign the bypass record.

(k) For permanent removal of interlock, after obtaining consent of Licensor / OEM / Detailed Engineering Agency, MOC should be generated and approval should be taken.

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Informative Annexure 11: Specimen procedure for deferment of scheduled Maintenance, Inspection, Testing and Calibration

This is specimen Procedure only. Organization should develop, approve and implement procedure in line with the guidelines mentioned in the AIM element of this document.

It is desirable to perform Maintenance/ Inspection/ Testing/ Calibration of the asset on or before its scheduled date, the continuous nature of unit operations or any other unavoidable condition may not always let the equipment be offered for inspection before the due date.

In such case deviation of Inspection Testing and Preventive Maintenance of critical equipment should be approved in deviation request cum approval form by respective maintenance/Inspection department. Record of such approved deviation should be kept by respective Maintenance Department.

Level	Approval Authority (Operation)	Approval Authority (Maintenance)
Level 1 (1-7 Days)	Level-1 (operation)	Level-1 (Maintenance)
Level 2 (8 to 14 Days)	Level-2 (operation)	Level-2 (Maintenance)
Level 3 (15 & above)	Level-3(operation)	Level-3 (Maintenance)

Deviation request cum approval form

Company Name and Logo					
Unit -		Equipment -		Equipment Tag No -	
Due Date of Inspection	Reason for not offering for Inspection	Contingency/ Mitigation Plan	Expected Date for Offering for Inspection	Operations Remarks	AIM / Maintenance Remarks
		Operation/ Technology		Maintenance/ Inspection	
Requested By					

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Approved by – (Level 1) (1-7 Days)		
Approved by – (Level 2) (7-15 Days)		
Approved by – (Level 3) (16 Days & above)		

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Informative Annexure 12: OISD Incident Classification and Reporting criterion

Incidents	Major	Minor	Near miss	Unsafe act/unsafe condition
Loss of primary containment	Any incident causing major loss of containment and having adverse impact outside the installation/ location premises including disaster defined under Section 2 (d) of DMP Act 2005.	Any incident not falling under any of the categories of major incident.	Near miss: As defined in Definitions	As defined in Definitions
Personnel losses	Any incident within unit/ installation premises leading to fatality(s). Any incident within unit/ installation premises, leading to permanent loss of body part and/ or permanent disability. Cumulative lost time, due to incident (within unit/ installation premises) is more than 45 man-days. Any incident of road accidents (during transportation of petroleum products) resulting in fire/ explosions which in turn leads to fatality(s).		Hi Po Near miss: The near miss that could in other circumstances, have realistically resulted in one or more fatalities.	
Fire	Any incident of fire not extinguished in 15 minutes.			
Damage	Any incident causing shutdown of operation(s) for more than eight hours. Any incident causing financial loss above Rs. 50 lakhs Any incident on account of explosion/ blowout/ radioactive (leakage or loss).			-
Reporting Criterion	should be reported to OISD at the earliest through electronics means and telephone and in FIR format within 24 hrs. from the time of incident.	Quarterly	Quarterly (Hi Po near miss)	

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Annexure 13:

(a) List of sample questions which an Investigators should ask to witness (b) List of sample questions for identifying incident root causes (Informative)

Sample questionnaire for incident investigation

a) List of sample questions which an Investigators should ask is appended below

WHO?

Who was injured?

Who saw the incident?

Who was working with the employee?

Who had instructed/assigned the employee?

Who else were involved?

Who else could have helped prevent the incident?

WHERE?

Where did the incident occur?

Where was the employee at the time?

Where was the supervisor at the time?

Where were fellow workers at the time?

Where were other people who were involved at the time?

Where were witnesses when incident occurred?

WHAT?

What was the incident?

What was the injury?

What was the employee doing?

What had the employee been told to do?

What tools was the employee using?

What machine was involved?

What operation was the employee performing?

What instructions had the employee been given?

What specific precautions were necessary?

What specific precautions was the employee using?

What protective equipment should have been used?

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What protective equipment was the employee using?

What had other persons done that contributed to the incident?

What problem or questions did the employee encounter?

What did the employee or witnesses do when the incident occurred?

What extenuating circumstances were involved?

What did the employee or witnesses see?

What will be done to prevent recurrence?

What safety rules were violated?

What new rules are needed?

WHY?

Why was the employee injured?

Why and what did the employee do?

Why and what did the other person do?

Why wasn't protective equipment used?

Why weren't specific instructions given to the employee?

Why was the employee in the position?

Why was the employee using the tools or machine?

Why didn't the employee check with the supervisor when the employee noted things weren't as they should be?

Why did the employee continue working under the circumstances?

Why wasn't the supervisor there at the time?

WHEN?

When did the incident occur?

When did the employee start that job?

When was the employee assigned on the job?

When were the hazards pointed out to the employee?

When was the employee's supervisor last check on job progress?

When did the employee first sense something was wrong?

HOW?

How did the employee get injured?

How could the employee have avoided it?

How could fellow workers have avoided it?

How could supervisor have prevented it - could it be prevented?

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b) List of sample questions for identifying incident root causes

1. Did a written or well-established procedure exist for employees to follow?
2. Did job procedures or standards properly identify the potential hazards of job performance?
3. Were there any hazardous environmental conditions that may have contributed to the incident?
4. Were the hazardous environmental conditions in the work area recognized by employees or supervisors?
5. Were any actions taken by employees, supervisors, or both to eliminate or control environmental hazards?
6. Were employees trained to deal with any hazardous environmental conditions that could arise?
7. Was sufficient space provided to accomplish the job task?
8. Was there adequate lighting to properly perform all the assigned tasks associated with the job?
9. Were employees familiar with job procedures?
10. Was there any deviation from the established job procedures?
11. Were the proper equipment and tools available and being used for the job?
12. Did any mental or physical conditions prevent the employee(s) from properly performing their jobs?
13. Were there any tasks in the job considered more demanding or difficult than usual (e.g., strenuous activities, excessive concentration required, etc.)?
14. Was there anything different or unusual from normal operations? (e.g., different parts, new or different chemicals used, recent adjustments/maintenance/cleaning on equipment)
15. Was the proper personal protective equipment specified for the job or task?
16. Were employees trained in the proper use of any personal protective equipment?
17. Did the employees use the prescribed personal protective equipment?
18. Was personal protective equipment damaged or not properly functioning?
19. Were employees trained and familiar with the proper emergency procedures, including the use of any special emergency equipment and was it available?
20. Was there any indication of misuse or abuse of equipment and/or materials at the incident site?
21. Is there any history of equipment failure, were all safety alerts and safeguards operational and was the equipment functioning properly?

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22. If applicable, are all employee certification and training records current and up to date?
23. Was there any shortage of personnel on the day of the incident?
24. Did supervisors detect, anticipate, or report an unsafe or hazardous condition?
25. Did supervisors recognize deviations from the normal job procedure?
26. Did supervisors and employees participate in job review sessions, especially for those jobs performed on an infrequent basis?
27. Were supervisors made aware of their responsibilities for the safety of their work areas and employees?
28. Were supervisors properly trained in the principles of incident prevention?
29. Was there any history of personnel problems or any conflicts with or between supervisors and employees or between employees themselves?
30. Did supervisors conduct regular safety meetings with their employees?
31. Were the topics discussed and actions taken during the safety meetings recorded in the minutes?
32. Were the proper resources (i.e., equipment, tools, materials, etc.) required to perform the job or task readily available and in proper condition?
33. Did supervisors ensure employees were trained and proficient before assigning them to their jobs?

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Annexure 14: United Nations (UN) international classification system / Code Number & Letters for important and popular chemicals (Informative)

UN international classification system

Class	Division	Sub-Division
Class 1 - Explosives	1.1	Explosives with a mass explosion hazard
	1.2	Explosives with a projection hazard
	1.3	Explosives with predominantly fire hazard
	1.4	Explosives with no significant blast hazard
	1.5	Very insensitive explosives
	1.6	Extremely insensitive explosive articles
Class 2 - Gases	2.1	Non Flammable Gases
	2.2	Flammable Gases
	2.3	Poison Gases
Class 3 – Flammable Liquids	3.1	Flashpoint below - 18°C (0°F)
	3.2	Flashpoint - 18°C and above but less than 23°C (73°F)
	3.3	Flashpoint of 23°C and upto 61°C (141°F)
Class 4	4.1	Flammable Solids
	4.2	Spontaneously combustible materials
	4.3	Materials that are dangerous when wet
Class 5	5.1	Oxidizers
	5.2	Organic Peroxides
Class 6 – Poisonous & Etiologic Materials	6.1	Poisonous Materials
	6.2	Harmful Substances
	6.3	Etiologic (Infectious) Materials
Class 7		Radioactive Materials
Class 8		Corrosives
Class 9		Miscellaneous Hazardous Materials

HAZCHEM Code for important and popular chemicals

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Substance	HAZCHEM Code
Petrol	3 **Y** E
Methyl Alcohol	2 P E
Liquefied Petroleum Gas (LPG)	2 W E
Ammonia Liquefied	2 P E
Sulphur	2 **Z**
Kerosene	3 **Y**

It is important to note that the objective of the HAZCHEM code is not only to identify the chemical carried in the vehicle, but the purpose of providing guidance on the basic approach to dealing with an emergency.

In interpreting the HAZCHEM code, the following points will be useful:

(i) If necessary, a firefighting medium represented by a higher number than that shown may be used, but not represented by a lower number.

(ii) Where the letter appears as white on black, police and other non-fire service personnel need to wear breathing apparatus only for a fire and not for a spillage, but firemen are required to wear it in both cases.

(iii) Letter E indicates that the officer in charge should consider civil evacuation of the area.

The Indian Chemical Manufacturers Association (ICMA), in their publication "Code for safe transportation of hazardous substances by Road" recommends that area within a minimum radius of 300m should be considered for evacuation wherever 'E' appears in HAZCHEM code.

iv) The number represents the type of firefighting medium to be used

Number	Fire Fighting Medium	Remarks
1	JETS	
2	FOG	In the absence of fog equipment, a fire spray may be used
3	FOAM	
4	DRY AGENTS	Water must not be allowed to come in contact with the substances at risk.

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v) The letters (P, R, S, T, W, X, Y, Z & E) signify four aspects viz.

i) Method of controlling spillage

a) by diluting or

b) by containing

ii) Personal protective equipment to be worn by fire fighters

iii) Reactive nature of Chemical, and

iv) Need for evacuation.

Example: For Methyl Alcohol with UN number 1230 and HAZCHEM code is 2PE and would be decoded as:

2 - Fog equipment is recommended (extinguishing agents corresponding to higher number may also be used).

P - Can be violently (V) reactive. Full body clothing with breathing apparatus is necessary. The substance may be diluted and washed to drain

E - Consider evacuation as first priority.

Similarly, for motor spirit (petrol) with UN number 1203, the HAZCHEM code is **3YE**, and this would mean

3 - Use Foam only.

Y - Can be violently (V) reactive or explosive. Breathing apparatus plus protective gloves be used in case of fire. Personal protective equipment is not a requirement in case of spillage. Any spillage of the substance should be contained.

E - Consider evacuation as a first priority

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Annexure 15: Content of a typical project HSE plan (Informative)

Table of Contents

(a) Introduction

(b) Purpose

i. Project HSE Vision

ii. Project HSE Objectives

(c) HSE Policy

(d) Development of Key HSE Performance Indicators for Project

(e) Internal Stakeholders

(f) Project HSE Resources

(g) Safety (HSE) Action Monitoring System

(h) Project HSE, CSR and Security Organization and Responsibilities

i. Responsibilities of The Project Manager

ii. Responsibilities of HSE Team

iii. Responsibilities of Security Team

(i) HSE and Operations Assurance

i. Project HSE Reviews (PHSER)

- PHSE-I & Il Project Design & Development Phase
- PHSER-Iii -Detailed Engineering & Design Phase
- PHSER-Iv Construction1
- PHSER-V Pre-Commissioning 1 Commissioning

ii. HSE Performance Monitoring

iii. HSE Leadership Review

iv. Annual HSE Assurance Letter.

v. Integrated HSEQ Compliance Audits

vi. Post-Project Contractor's HSE Performance Evaluation

(j) Development of The Project with Safe Facilities.

i. Definition Phase

ii. Detailed Engineering and Design Phase

iii. COMAH Study Development

iv. Construction Phase

v. Pre-Commissioning 1 Commissioning Phase21

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vi. Start-Up

vii. Production Team Preparedness

viii. Operations Reference Documents

(k) Training and Orientation.

i. Induction

ii. Supervisory Training

iii. Job Safety and Risk Assessment Training

iv. Organization Observation Program

v. Incident Reporting and Investigation

(l) References

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Annexure 16: Details PHSER objectives for various phases and typical sample checklist of HSE deliverable (Informative)

Objective of various PHSER are as follows:

PHSER Phase I - FEED /Basic Design Stage

(a) Review options evaluated by the project and confirmed that HSE have been taken into consideration in the basic design.

(b) To confirm that all HSE concerns relating to the characteristics of the full lifecycle of the project, novel technology, and nature of the location have been identified.

(c) To verify that processes are in place to ensure that all applicable regulations, HSE commitments in contractual agreements, Organization standards requirements, and HSE expectations have been identified.

(d) To confirm that an adequate HSE plan has been established.

(e) To review the potential Major Accident Hazard (MAH) of the selected project option and confirm that an adequate plan has been established to eliminate or mitigate MAH.

(f) To confirm that process safety studies, including a HAZOP strategy, have been defined and that it is appropriate for the project.

(g) Timing: PHSER should take place near the end of the FEED stage after selection of the project option and location.

PHSER Phase II - Detailed Engineering Stage

(a) To confirm that actions from the previous PHSER have been closed or are being suitably progressed. Review any significant changes to the project since the previous stage for potential HSE concerns that were not addressed by the previous PHSER.

(b) To confirm that appropriate HSE studies (including HIRA/ PHA), 3D review is completed within the prescribed times, their recommendations are being tracked, and actions potentially affecting the design have been completed and are incorporated into the project design.

(c) To confirm that MOC procedures are being applied and appropriate hazard review of changes has been instigated to maintain HSE integrity.

(d) To confirm that an HSE management system, including an HSE plan, is being implemented effectively to manage HSE risks during construction.

(e) To review the products of detailed engineering to confirm that that they are appropriate for construction and that they incorporate features for prevention, reduction, and mitigation of HSE risks.

(f) To verify the project and operation planning for start-up, including development of procedures; training and competence; pre-commissioning and commissioning activities; and compliance with regulations and HSE commitments in contractual agreements.

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(g) Detailed engineering PHSER should take place towards completion of detailed engineering around the time that Approved for Construction (AFC) P&IDs and cause and effect drawings are issued and before significant above ground construction activities commence at site.

(h) Detailed engineering and construction PHSERs provide an early look at installation, startup planning and preparation, and key decisions on how HSE aspects of the project will be managed by the site, including which HSE regulations apply in the startup phase. This helps avoid surprises in the late Execute stage, which could delay startup.

PHSER Phase III - Construction Stage

(a) To confirm that actions from the previous PHSER and other HSE studies, including HIRA/ PHA have been closed or are being suitably progressed.

(b) To verify that project integrity management processes, including engineering and quality controls, are sufficient to deliver installation and/or asset integrity.

(c) To confirm that the MOC procedure is being applied.

(d) To confirm that construction and installation workforce training and competency assessment processes are in place.

(e) To verify that an HSE management system, including a construction HSE plan is in place, has been implemented, and assures HSE performance during construction.

(f) To review project's and operation's plans for pre-commissioning, commissioning, installation, and pre-startup; and progress on training, development/competency assurance, and update or development of operating procedures. Verify that an appropriate programme of safety reviews has been established and is progressing. Confirm that appropriate interface procedures and processes are in place for any project activities to be performed within or close to existing operations.

(g) To review progress on the site HSE management systems, HSE procedures, and development /update of the HSE compliance matrix.

(h) Timing: PHSER should be conducted during the construction phase, typically soon after commencement of significant piping installation.

(i) PHSER should be conducted at construction site.

(j) For projects in which the majority of construction takes place during a turnaround, it may be practical to combine aspects of the construction PHSER with the pre-startup PHSER.

PHSER Phase IV - Pre-Startup Stage

(a) To verify that the project, operations, and site are fully implementing a robust process to confirm preparedness and obtain approvals for startup, including confirmation that all HSE issues and actions have been satisfactorily addressed, completed, and documented.

(b) To verify integrity of design has been maintained and that deviations from design have been satisfactorily addressed and will not compromise HSE performance.

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(c) Confirm that processes are in place to maintain installation integrity in operations in accordance Organization requirements.

(d) To verify that pre-commissioning and commissioning have been satisfactorily completed sufficiently for the introduction of hazardous materials.

(e) To confirm that commissioning and operational personnel are adequately trained, competent, equipped and that necessary procedures are available.

(f) To confirm that Organization operation has made adequate preparations for startup.

(g) To confirm that emergency response plans and procedures have been established and tested.

(h) To confirm that notifications and requirements for regulatory and HSE contractual compliance have been completed and handed over to operations for ongoing compliance.

(i) The PHSER phase IV should be conducted immediately prior to the introduction of hazardous materials.

PHSER Phase V - Post - Operate Stage

(a) To verify that HSE performance of the operating facility meets the design intent and, regulatory, and HSE contractual compliance requirements.

(b) To confirm that the operating facility has adopted and embedded HSE design philosophies, safeguards, processes, and tasks established by the project for ongoing HSE performance of the operating facility and to meet regulatory and contractual obligations.

(c) Timings: The Operate stage PHSER should take place within 12 months of project startup.

PHSER Phase VI - Abandonment Stage

(a) PHSER reviews should be conducted on projects that decommission a facility.

(b) Decommissioning is typically handled as a separate project. PHSERs should ensure that all HSE issues are identified, plans are established for mitigating HSE risks during decommissioning, and programmes are developed for managing long term HSE concerns.

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Informative Annexure 17: Typical checklist of Project HSE deliverable

HSE Deliverables Plans, Studies, Reviews & Assessments

No.	HSE Deliverables Plans, Studies, Reviews & Assessments	FEED	Detail	Execute
		Yes	Yes	Yes
1.	Project HSE Plan	✓	✓	✓
2.	Preliminary Risk Register	✓		
3.	Technology selection	✓		
4.	Best Practices Review	✓		
5.	Pollution Prevention Control Review	✓		
6.	HAZID		✓	
7.	Hazard & Effects Register / Update	✓	✓	✓
8.	Environmental Baseline Study	✓		
9.	Environmental Impact Assessment		✓	
10.	Health Risk Assessment	✓	✓	✓
11.	Occupational Health – Hazard Analysis (Critical Points)	✓	✓	
12.	HSE Philosophy Document / Update	✓	✓	
13.	Emergency Response Plan / Update	✓	✓	✓
14.	Environmental Impact Statement	✓		
15.	QRA – Quantitative Risk Assessment			
16.	PHSER - I	✓		
17.	PHSER - II		✓	
18.	PHSER - III			✓
19.	PHSER - IV			✓
20.	PHSER - V			✓
21.	Constructability Review	✓	✓	
22.	Fire Safety Assessment Study		✓	
23.	Gas Dispersion Modelling Study			
24.	Fire Water System Hydraulic Calculations			
25.	SIL (Safety Integrity Level) Study Review		✓	✓
26.	Safety Critical Equipment Review			
27.	Simultaneous Operations Review		✓	
28.	3D Model Review			✓

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29.	Waste Management Plan			✓
30.	Noise & Vibration Studies			✓
31.	Ergonomic Studies			✓
32.	Construction Site Safety Plan			✓
33.	Post Mobilization Audit			✓
34.	Formal HSE Closeout Report			✓

HSE Deliverables Drawings, Registers & Manuals:

No.	HSE Deliverables Drawings, Registers & Manuals	CONCEPT Yes	FEED Yes	EPC Yes
1.	Overall Plot Plan	✓	✓	✓
2.	Hazardous Area Classification		✓	✓
3.	Escape Route, Muster Station & Safety Signs		✓	✓
4.	Emergency Lighting		✓	✓
5.	Safety Equipment (Wind sock, safety showers, MCP, PPE etc.)			✓
6.	Blast Overpressure / Explosion Contours		✓	
7.	Heat Radiation Contours		✓	
8.	Gas Dispersion Contours		✓	
9.	Fire Hazardous / Fire Proofing Zones		✓	
10.	Passive Fire Protection Details		✓	
11.	Flare Sterile Area Layout			✓
12.	Smoke & Fire Damper Layout			✓

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13.	Fire Detection & Alarm System Layout		✓	
14.	Fire Monitor & Deluge Area Coverage			✓
15.	Inert Gas Fire Extinguisher System			✓
16.	Fire Extinguisher, Firefighting Equipment Layout			✓
17.	Register of Safety Related Devices			✓
18.	Register of Safety Critical Equipment			✓
19.	Environmental Aspects & Impacts Register	✓	✓	
20.	Lock Open / Lock Closed Register			✓

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Informative Annexure 18: Specimen Performance Management Sheet

Organization name

Monthly HSE Report

Location:

Month -Year: Month

Maximum HSE Score	
Score Attained	

1. Safety Organisation**:**			
		Score:	Score Earned:
Details	Date	Briefing by OIC (Yes/No)	Topic
Monthly Safety Review meeting briefings			Review of Safety Observations &compliance, near miss reporting from contractors, Statutory approval and Review of SOPs, training on SOPs, Review of SOPs violation, HSE training ESA and ISA. Emergency preparedness, Near miss and safety suggestion, status of fire tender, fire water pump house and manpower etc. report.
Review of HSE policy to be reported whenever reviewed			
Marking system to be developed by organizations *e.g.* Monthly HSE briefing undertaken: Max ___ score for each month Review of HSE Policy (Yearly) : Max 01 score for each month, cumulative 12 score in a year			

2. Consultation & Participation

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a) Safety Suggestions from Workforce		Score:	Score Earned:
Nos. of Suggestions Received in Reporting Month:		Nos. of Cumulative Suggestions Received till Reporting Month:	
Marking system to be developed by organizations *e.g. Minimum One Safety Suggestion Received in the month:----- Score, Otherwise 0 Score*			
b) Safety Committee Meeting (Quarterly)		Score:	Score Earned:
Date of Last Meeting	Nos. of Recommendations	Nos. of Recommendations Complied	
Due in April-June	-	-	
Marking system to be developed by organizations *e.g. Safety Committee Meeting conducted as per schedule: ----- Score Otherwise 00 Score.*			

3. <u>Process Safety Information</u>:			
a) Display of SDS		Score:	Score Earned:
Nos. of Hazardous Chemical Used	Nos. of SDS mentioned in ERDMP/DMP	SDS of all chemicals should be prepared and kept available at Common Portal. However, SDS of major chemicals should be displayed at site.	
b) Display of Electrical Area Classification:		Score:	Score Earned:
Available		Displayed at Site	Yes
c) Display of Critical SOPs		Score:	Score Earned:
Nos. of Critical SOPs		Nos. Displayed	
Marking system to be developed by organizations *e.g. a) If SDS prepared for all Hazardous Chemicals: 02 Score Otherwise 00 Score. b) Electrical Area Classification Drawing Available/Display: 01 Score Otherwise 00 Score. c) If all Critical SOPs Identified and Displayed: 02 Score Otherwise 00 Score.*			

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4. Risk Analysis and Management:			
a) Risk Analysis (QRA)		Score:	Score Earned:
Last Conducted On	Nos. of Recommendations	Nos. of recommendations Complied	
b) HAZOP:		Score:	Score Earned:
Last Conducted On	Nos. of Recommendations	Nos. of recommendations Complied	
If all the recommendations of QRA/HAZOP are complied with in 2 years after date of study: Score 02 Otherwise 00 Score.			
c) Hazard Identification & Risk Assessment (HIRA)		Score:	Score Earned:
Hazard Identification & Risk Assessment for O&M Activities or Equipment carried out.			
Marking system to be developed by organizations *e.g. If HIRA conducted for all critical work, Score : 02, Otherwise 00 Score*			

5. Control of Defeat & Reliability of Critical System & Devices:		
	Score:	Score Earned:
Nos. of Trip Bypassed	Nos. Bypassed more than 30 days with approval of CGM/GM/OIC	
Marking system to be developed by organizations *e.g. If trip bypassed for more than 30 days with approval): Score 03 Otherwise 00 Score.*		

6. Personal Monitoring:			
		Score:	Score Earned:
		Due On	Last Checked On
Noise	Frequency: Quarterly		

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Illumination	Frequency: Half Yearly		
Marking system to be developed by organizations *e.g. If testing done as per scheduled, then 01 score otherwise 00 score.*			

7. Safe work practices, Procedures and Permits		
Work Permit System	Score:	Score Earned:
Nos. of Work Permits issued (Hot Work Permits or any job in which F&S official/nominated F&S person involved)	Nos. of Job Safety Analysis carried out (Hot Work Permits or any job in which F&S officials/nominated F&S person involved).	
Marking system to be developed by organizations *e.g. Job Safety Analysis done for 100%: Score 04 Otherwise 00 Score. Safety/Tool Box Talks to be given before starting all jobs*		

8. Safe <u>Operation Management</u>			
a) Review of SOPs/SWPs		Score:	Score Earned:
Nos. of SOPs	Nos. Scheduled for Review in Reporting Month	Nos. Reviewed in Reporting Month	Cumulative Nos. Reviewed till Reporting Month (Yearly)
Marking system to be developed by organizations *e.g. If SOPs reviewed as per schedule* (Yearly) *: Score 02 Otherwise 00 Score*			
b) SOPs Compliance Check		Score:	Score Earned:
No. of SOP compliance checks conducted during the month:		No. of SOP non-compliance reported:	
If compliance checked as per schedule, then 02 score otherwise 00 score.			

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9. **Asset Integrity Management**				
Fire Fighting Appliances/Equipment			Score:	Score Earned:
Items	Available	No. in Working Condition	Remarks	
Fire Tenders*				
ERV*				
Fire Extinguishers				
Marking system to be developed by organizations *e.g. Fire Tender & ERV: If Fire Tender(s)/ERV(s) Breakdown Time is less than 1%: Score 03, Otherwise 00.* *Fire Extinguishers- % Availability > 95% Score: 01 Otherwise 00.*				
d) Fire/Leakage Detection & Alarm System			Score:	Score Earned:
Items	Available	No. in Working Condition	Frequency of Checking/Testing	Last Date of Testing
Smoke Detectors				
UV Detectors				
Heat Detectors				
LEL Detectors (Field)				
Manual Call Points				
Marking system to be developed by organizations *e.g. Working condition: > 95% - 03 Score, 90 – 95% - 2 score, 70-90% - 01 Score, Otherwise- 00 Score*				
e) Water-Based System & Non Water-Based System			Score:	Score Earned:
Items	Available	No. in Working Condition		Remarks
Pumps (Main and Stand by)				
Hydrants				
Monitors				
Spray System				
DCP Flooding System				
Co2 Flooding System				
Foam System				

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Inergen/ Argonite Flooding System			
Marking system to be developed by organizations *e.g. Working condition: > 95% - 03 Score, 90 – 95% - 2 score, 70-90% - 01 Score, Otherwise- 00 Score*			

a) Load Bearing Installed Equipment			Score:	Score Earned:
Items	Total Qty. (in Nos.)	Nos. to be Tested as per Schedule	Nos. Tested	Remarks
Crane				
Hydra				
Forklift/Others				
EOT				
HOT				
b) Portable Equipment			Score:	Score Earned:
Chain Pulley Blocks				
Slings/Wire Ropes				
Marking system to be developed by organizations *e.g. Tested as per schedule - 02 Score, otherwise - 00 Score.*				

c) Pressure Vessels	Score:	Score Earned:
No. of Vessels due for Hydro-testing	Nos. Tested	Remarks
No. of Vessels due for Thickness Measurement	Nos. Tested	Remarks/Date of Testing
Tested as per schedule - 02 Score, otherwise - 00 Score		
d) Pipeline Thickness Measurement	Score:	Score Earned:
No. of pipelines/pipeline locations due for thickness testing	Nos. Tested	Remarks/Date of Testing
Marking system to be developed by organizations *e.g. Tested as per schedule - 02 Score, otherwise - 00 Score*		

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e) Calibrations/Resetting			Score:	Score Earned:
Items	Qty. Installed/ Available	Nos. due for Calibration in Reporting Month	Nos. Calibrated in Reporting Month	Cumulative Nos. Calibrated till Reporting Month
PSVs/TSVs				
LEL Detectors				
Marking system to be developed by organizations *e.g. Calibration as per schedule 02 Score, Otherwise 00 Score*				

10. Training and competence					
a) General Operational & HSE Training			Score:	Score Earned:	
Date	Topic Covered	Employees Covered		Others (Security / Contractors, Tanker/Truck Drivers etc.) Covered	
		Scheduled	Actual	Scheduled	Actual
	Process safety, Electrical safety, PPE's& Road safety				
b) SOPs/SWPs (All O&M Personnel to be covered once in a year)					
Date	Topic Covered				
Marking system to be developed by organizations *e.g. Training Programs conducted as per schedule along with target participants of Respective Category: Full Score Otherwise 00 Score. Yearly target will be monitored for evaluation*					

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11. Incident Reporting, Investigation and Analysis:				
a) Near Miss Incidents			Score:	Score Earned:
Date of Incident & Incident No.	Nos. of Near miss reported		Nos. of observations Complied	
Marking system to be developed by organizations.				
b) Incident Reporting			Score:	Score Earned:
Events	Date & Time		Location	Incident No.
Fire, Hydrocarbon Leaks, Other Incidents (Fatal/Non-Fatal Only), Any Interruption to Process/ Pipeline Operation due to above, Property Loss (Approx. Value in Rs.), If Any Due To Incident, Fire etc., First Aid Injuries				
Marking system to be developed by organizations				
c) Incident Investigation and Analysis			Score:	Score Earned:
Date & Incident No.	Nos. of Recommendations		Nos. of Recommendations Complied	
A marking system to be developed by organizations *e.g. Nos. of Recommendations complied as per Target Date: 02 Score, Otherwise 00.*				

12. Emergency Preparedness Exercise:			
a) On Site Emergency Exercise (Quarterly)		Score:	Score Earned:
Due on (Qtr.)	Date of onsite drill	Last On Site Conducted on (last Qtr.)	
b) Off Site Emergency Exercise (Annual)		Score:	Score Earned:
Due on	Date of offsite drill	Last Off Site Conducted on (Last year)	

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Marking system to be developed by organizations *e.g. Emergency Exercise carried out as per schedule: 02 Score otherwise 00.*		
c) Emergency Communication (Weekly)	Score:	Score Earned:
Date of last testing of Siren		
Marking system to be developed by organizations *e.g. Testing of Emergency Communication as per Schedule: Score 02 Otherwise 00 Score.*		

13. Environment Management:		Score:	Score Earned:
Monitoring of Environment Consent/Authorization Conditions			

14. Occupational Health:	Score:	Score Earned:
Total No. of Employee		Nos. of Employees undergone Health Check up
Marking system to be developed by organizations *e.g. Annual Health Check-up carried out as per schedule yearly: 02 Score otherwise 00 It is being reviewed on yearly basis.*		

15. SMS Audit:			
a) External Safety Audit		Score:	Score Earned:
Date of Audit	Nos. of Recommendations	Nos. of recommendations Complied	

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b) Internal Safety Audit		Score:	Score Earned:
Date of Audit	Nos. of Recommendations	Nos. of recommendations Complied	
Marking system to be developed by organizations *e.g. Nos. of Recommendations complied,* >95% - 03 score, 90-95% - 02 score, 75 – 90% - 01 score, otherwise 00 score			

Highlights of the Month	
1.	
2.	
3.	
4.	

Rating Score	**Rating**
100	Excellent
≥98&<100	V. Good
≥96 &<98	Good
≥94 &<96	Fair
≥90 &<94	Poor

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Informative Annexure 19: Typical criterion/ performance standards/ parameter

SMS element	Typical criterion/ performance standards/ parameter
Safety Organisation	• No of Safety survey conducted (Planned Vs actual) • Overdue Recommendations of Safety survey • No of safety committee meetings conducted (Planned Vs actual) • Overdue recommendations of safety committee meetings
Consultation & Participation	• No. of suggestion received from work force in a particular period
Hazard identification and Risk Analysis	• Total No. of overdue HIRA/ PHA recommendations for implementation. • Scheduled vs. completed HIRA/ PHAs
Process Safety Information (PSI)	• Overdue updation of PSI documents (No) • No. of PHAs deferred due to insufficient PSI • No. of Process Safety Events (PSE) with PSI as root cause
Operating Procedures	• Total No. of overdue Operating manuals for review • Total No. of overdue SOP for review
Safe Work Practices, Procedures and Permits	• % Work Permit Audited Vs Planed in the Month • No of Permit non compliances found
Training and competence	• Number of trainers available in the installation to train the workforce. • % of workforce trained in SMS elements training as per schedule. • % of workforce due for mandatory and non-mandatory training. • Number of SOP Training done and skill demonstrations/ job cycle checks completed in the Month (Planned Vs actual)) • Overdue competency assessment (actual Vs plan) • Competency profiles defined for each role (actual Vs plan) • Training records
Contractor Management	• No of incident involving contractor personnel • No of contractor personnel training done (planned Vs actual) • Availability of bridging document, if applicable.

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Safe Operation Management	• No of interlock bypassed more than 30 days after approval of highest authority • No of deviation from Safe Operation Limit (Level, Flow, Temp., Pressure) in the Month • Average no of alarm/ shift
Asset Integrity Management (AIM)	• Overdue inspection of safety critical equipment • No. of Interlocks of Machine Monitoring / Equipment kept bypassed • No. of online sealing clamps in hazardous services pipeline or equipment. • No. of occasion of PSV pop up in particular period
Management of Change	• Total No. of MOC close out overdue
Incident Reporting, Investigation Analysis and Learning	• Number of Near Miss reported–in the month (Process Safety/Work Place Safety Near miss) • No. of unsafe act/ condition • Number of overdue Investigation (Cumulative till Now) • Number of Investigation Recommendations overdue • No of Unplanned / Emergency Shutdowns taken in the Installation due to Process Incidents (Cumulative Numbers till Now) • Closure of reported Unsafe condition/ act.
Emergency Response Management	• No. of mock drills conducted as per schedule (actual vs plan) • Number of overdue ERDMP Mock Drill Recommendations (Till Now Cumulative Nos) • No of firefighting system not in operation in the Month • % of Gas Detector Testing Compliance (actual Vs plan) • No. of Gas Detector not functioning • % of Fire equipment overdue for Inspection and Certification
Transport Safety Management	• Number of motor vehicle incidents reported and investigated • Overdue audit recommendations • % compliance against non-conformances found in inspections related to vehicle such as fittings during loading, unloading operations, non-standard items/ maintenance, procedures

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	• Number of local community road safety awareness programmes held • % monitoring & analysis of VTS (Plan vs Actual) • No. of VTS have non-conformities
Project HSE Management	• No of overdue PHSER recommendations
Occupational Health	• % compliance of Periodic Medical examination of workforce • Hygiene survey conducted (actual Vs plan) • Average noise level in dB of working area(s) • LUX level as per area classification/ facility
Pre-startup Safety Review	• No. of Recommendations overdue
Safety Management System Audit	• % of SMS audits completed as per scheduled (Number of audits Completed/ Scheduled-includes Internal and External audits) • Number of SMS Audit recommendation overdue for more than 2 years.
Performance Measurement	• Performance evaluation done (Actual Vs plan) • Corrective action taken (actual Vs planned)

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Annexure 20: Major changes in revised edition

1. Safety Organization

a) The safety policy of the organization has been replaced with a Health, Safety & Environment policy in line with the requirements of ISO 45001:2018.

b) Organization's leadership and commitment has been introduced to provide strong & visible leadership and to ensure the commitment is translated into the necessary resources, to develop, operate and maintain the safety management system towards strategic objective.

c) Safety culture & promotion has been incorporated as a key organizational factor for implementation of a healthy safety management system.

2. Hazard Identification and Risk Analysis (HIRA)/ Process Hazard Analysis (PHA)

a) The requirement of conducting HIRA/ PHA for all 'facilities and processes' in the extant guidelines has been replaced with 'activities' for identifying hazards, understanding potential incident scenarios, evaluating risk to people and to safeguard the environment, property and business. The identification process should be dynamic and ongoing to ensure that any new hazards must be identified throughout different phases of the project.

b) Bow-tie analysis and Layer of Protection Analysis (LOPA) has been included in the commonly used technique for hazard identification and qualitative/ semi-qualitative analysis. In addition, a detailed description of commonly used technique has been included in the annexure.

3. Process Safety Information

a) Updation of process safety information should be done as often as necessary or at least predefined frequency (once in every three years) whichever is earlier.

b) Whenever the original process design information no longer exists, information should be developed in conjunction with sufficient hazard analysis after thorough review and approval process.

c) A documented procedure for control of Process Safety Information/ Event should be developed by the organization.

4. Operating Procedures

a) Organizations should develop an operating manual specific to the operation/ installation.

b) Operating manuals should be reviewed, revised and approved as often as necessary or at least once in three years.

c) Standard Operating procedures (SOP) should be a part of an operating manual, which serves as a tool to ensure that activities are performed properly and follows operational, quality, environmental and safety requirements.

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5. Training and Competence

a) In order to provide assurance of competence, a training and competency management system should be established by the organization, which should contain the minimum required competence and level assessment required for each role.

b) The effectiveness of training and competencies should be evaluated and assessed on a regular basis and process should be developed for taking feedback from the participants on the effectiveness of trainers/ training providers.

c) The period of refresher training should be as per organization requirements as per job demand and feedback. However, the same should be in line with applicable OISD standard.

d) Contractors providing services which do not influence the operation of the facility should be trained to perform their jobs in a safe and environmentally sound manner as per defined job competence.

6. Contractor Management

a) Organization should develop, establish and maintain a contractor management system. The intent of contractor management should be to implement practices to ensure that contractor personnel can perform their jobs safely.

b) Responsibilities for Management & Contractor has been modified and responsibilities of contract workforce has been defined in order to provide an effective safety management system.

7. Safe Operation Management

A safe operation management programme should be developed and implemented which should establish clear expectations for every asset facing activity/ operations such as following procedures, expectations from workforce, clear instructions for safe and controlled operation, its monitoring, controlling access to hazardous area, reliable communication etc.

8. Asset Integrity Management (AIM) Programme

Each organization should implement the AIM programme covering various stages of the lifecycle of an asset. The assets including safety critical equipment to be covered under AIM should be clearly identified and listed.

9. Incident Reporting, Investigation, Analysis and Learning

A step wise detailed procedure has been developed for incident reporting, investigation, analysis and learning.

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10. Project HSE Management

A new section/ topic on project HSE management has been incorporated. The purpose of this section is to provide guidance to project delivery on how to align and comply organization's safety management system during projects lifecycle and will facilitates preventive approach to risk management (control and mitigation) at various stages of projects.

11. Safety Management System Audit

a) The organizations should establish and maintain an audit program and procedures for the periodic audit of the safety management system covering activities & areas, frequency, composition of audit team, process and reporting system.

b) All oil & gas installations, including E&P, should be audited once a year.

c) The duration of the audit should be decided depending upon the areas/ location size, type/ complexity of the installation, installed facilities and location management.

d) All the actionable points of internal audit should be closed in a time bound manner. The audit observations not closed within 6 months shall be brought to the notice of higher management of the organization.

e) Third party audit should also be carried out at organizational level to review corporate level documents, policies, leadership commitment and culture.

12. Management Review

A new section on management review has been incorporated in the guideline. The management review element monitor the near-real-time effectiveness of the safety management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.

Basic steps of QRA, individual and societal risk and ALARP (as low as reasonably practicable) level/ tolerable limit values has been defined for acceptable, tolerable and intolerable.

A general guideline on key elements for developing bridging documents has been added to the annexure.

General guidelines for developing shift handover/ take over procedure and recording information has been included in annexure.

Various other important annexure for document control, operating manual contents, contractor declaration on safety training, interlock bypass procedure & format, procedure for deferment of scheduled maintenance, inspection, testing & calibration, incident classification & reporting criterion, sample questions for incident investigation & identifying root cause, UN international classification for important & popular chemicals, content of typical project HSE, PHSER objectives for various phases, checklist for HSE deliverable, specimen for safety performance management and typical performance parameters are included.

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Annexure 21: List of previous functional committee(s)

1st FUNCTIONAL COMMITTEE
(OCT 2001)

NAME	ORGANISATION
LEADER	
A A Raichur	Hindustan Petroleum Corporation. Limited (Ref), Mumbai
MEMBERS	
C S Chakrabarti	Bharat Petroleum Corporation Limited (Ref), Mumbai
T S Lamba	Oil & Natural Gas Corporation. Limited, Kolkata
N Rengaswamy	Engineers India Limited, New Delhi
S Thangavelu	Chennai Petroleum Corporation Limited, Chennai
R C Pandey	Bongaigaon Refinery & Petrochemicals Limited, Bongaigaon
N Dasgupta	Bharat Petroleum Corporation Limited (Mktg), Mumbai
T K Kumar	Indian Oil Corporation Limited (PL), New Delhi
S S Maji	Indian Oil Corporation Limited (Ref), New Delhi
Dr. D Buragohain	Gas Authority of India Limited, New Delhi
MEMBER CO-ORDINATOR	
S N Mathur	Oil Industry Safety Directorate, New Delhi

(In addition to the above, several other experts from industry contributed in the preparation, review and finalization of this document).

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OIL INDUSTRY SAFETY DIRECTORATE

कॉन्ट्रैक्टर सेफ्टी

ओ आई एस डी –जी डी एन-207

CONTRACTOR SAFETY

OISD -GDN- 207

ENGINEERS INDIA LIMITED

Inception	October 2002
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FOR RESTRICTED CIRULATION ONLY

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: https://www.oisd.gov.in Tele: 0120-2593833

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 by 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 three decades 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

The Oil Industry in India is over 100 years old. As such, various practices have been in vogue because of collaboration/ association with different foreign companies and governments. Standardization in design philosophies, operating and maintenance practices remained a grey area. This coupled with feedback from some serious accidents that occurred in the past in India and abroad, emphasized the need for the industry to review the existing state-of-the-art in designing, operating and maintaining of Oil and Gas installations.

With this in view, the Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardizing and upgrading the existing standards to ensure safe operations. Accordingly, OISD constituted a number of functional committees of experts nominated from the industry to draw up standards and guidelines on various subjects.

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 figures and photographs used in the document, if any, are representative in nature.

We, at OISD, are confident that the provisions of this standard, when implemented in totality, would go a long way in ensuring safe operation of the target group of locations.

Needless to mention, this standard, as always would be reviewed based on field level experience, incident analysis and environment scanning. Suggestions from all stake holders may be forwarded to OISD.

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NOTE

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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

CONTENTS

SECTION	DESCRIPTION	PAGE NO.
1.0	**INTRODUCTION**	**1**
2.0	**SCOPE**	**1**
3.0	**DEFINITIONS**	**1**
4.0	**DUTIES / RESPONSIBILITIES**	**2**
4.1	Owner	2
4.2	Contractor	5
4.3	Consultant	8
4.4	Designer	9
5.0	**SAFETY MANAGEMENT**	**9**
5.1	Job Safety Analysis (JSA)	9
5.2	Criteria of a Selection of a Contractor	9
5.3	Site Planning and Layout	10
5.4	Gate Entry Procedure	11
5.5	Training	13
5.6	Inspection / Audit	17
5.7	Penalties for non-compliance	17
5.8	Incident Reporting and Investigation System	20
5.9	Safety Committee Meetings	20
5.10	Safety Equipment / Personnel Protective Equipment	23
6.0	**REFERENCES**	**24**
	ANNEXURE I List of BIS codes / Statutory Regulations	**25**
	ANNEXURE II Checklist for Safety Inspection / Audit	**28**

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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 along with 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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LIST OF BANKS

[ANNEXURE - XVI TO SPECIAL CONDITIONS OF CONTRACT

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.

APPENDIX-A TO SCC
(TAXES & DUTIES)

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A. Price basis w.r.t inclusion/exclusion of taxes and duties

1. The quoted price(s) shall be inclusive of all the taxes and duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively) and GST compensation cess, (if applicable) leviable on sale of finished goods/services.
2. In case of foreign bidders, bidders shall submit their prices on FOB international sea port of exit basis/CFR on destination port basis (INCOTERM 2020), unless otherwise stated in the bid document. FOB/CFR prices quoted shall be inclusive of all applicable taxes upto FOB international sea port of exit/CFR on destination port basis.
3. Transportation charges (if applicable) upto respective project site shall be exclusive of GST.
4. Site work prices, if applicable shall be inclusive of all taxes and duties except GST. All necessary registrations, if required, for carrying out the site activities shall be done by the bidder and costs towards the same shall be included in quoted site work prices.
5. Prices of per diem supervision charges, training/AMC, HAZOP Study etc. (as applicable) shall be exclusive of GST. However, GST shall not be applicable on training provided at foreign bidder's work/training facilities in any territory other than India.

B. TAX CLAUSES

1. Goods and Services Tax

a. The supplier/contractor will be liable to register with the respective tax authorities and to submit self-attested copy of such registration certificates and the supplier/contractor will be responsible for procurement of goods/services in its own registration (GSTN).

b. Supplier/Contractor shall be required to issue tax invoice in the form and manner prescribed under GST Act read with Rules thereunder including E-Invoicing provisions so that input tax credit under GST can be availed by OWNER. In the event that the supplier/contractor fails to provide the Tax Invoice/E-Invoice in the form and manner prescribed under the GST act read with GST invoicing rules thereunder, OWNER shall not be liable to make any payment on account of GST against such invoice.

c. In case supplier/contractor is not subject to E-Invoicing provisions under the GST Laws as amended from time to time, then a declaration to this effect shall be furnished by the supplier/contractor in format prescribed in Annexure A along with the Invoice.

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d. GST shall be paid to supplier/contractor against receipt of Tax Invoice/E-Invoice and on auto-population of input tax credit on GSTN portal. In case of non-receipt of Tax Invoice/E-Invoice and/or non-auto-population of input tax credit on GSTN portal, Owner shall with hold the payment of GST.

e. The supplier/contractor shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the rules and regulations, as applicable from time to time. In particular, if any tax credit, refund or any other benefit Is denied/delayed to Owner or any interest/penalty is charged to Owner due to any non-compliance/ delayed compliance by the supplier/contractor under the GST Law (including but not limited to failure to upload the details of the sale on GSTN portal, failure to pay GST to the government or due to non-furnishing or furnishing of incorrect or incomplete documents, non-filing of GST return by the supplier/contractor), the supplier/contractor shall be liable to reimburse Owner for all such losses and other consequences including but not limited to the tax loss, interest and penalty. Owner shall be entitled to recover such amount from the supplier/contractor by way of adjustment from the next invoice, encashment of BG or by way of any other means either of same project or any other project of the Owner.

f. In case of any Advance including Mobilization/Secured/Other Advance is granted to supplier/contractor as per the provisions of Contract, then the supplier/contractor shall issue a Receipt Voucher / GST Invoice in the form and manner prescribed under GST Act read with Rules thereunder including e-invoicing provisions.

g. In case of any Price Variation as per the provisions of Contract, the supplier/contractor shall issue an Invoice in the form and manner prescribed under the GST Act read with Rules thereunder including e-invoicing provisions.

h. GST payable under reverse charge for specified services/goods under GST Act read with Rules thereunder, if any, shall not be paid to the supplier/contractor but will be directly deposited by Owner to the appropriate Government Tax Authority. If the same has already been reimbursed / paid to the supplier/contractor for any reason whatsoever, then Owner shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by Owner to supplier/contractor.

i. Where Owner has the obligation to discharge GST liability under reverse charge mechanism and Owner has paid or is liable to pay GST to the government on which interest/penalty becomes payable as per GST law for any reason which is not attributable to Owner or Input Tax Credit w.r.t. such payment is not available to Owner for any reason which is not attributable to

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Owner, then Owner shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by Owner to contractor/supplier.

j. TDS under GST, if applicable shall be deducted from supplier/contractor bills at applicable rates and a certificate as per rules for tax so deducted shall be provided to supplier/contractor.

k. The supplier/contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the supplier/contractor shall avail and pass on benefits of all exemptions/concessions available under applicable tax laws.

l. In case bidder is covered under composition scheme under GST law, then bidder shall quote the price inclusive of GST. Further, such bidder should mention "Covered under GST Composition Scheme" in column for GST of relevant price schedule(s). In case subsequently such bidder gets covered under regular GST regime, the prices including GST under regular GST regime shall not exceed the prices quoted by the bidder under composition scheme.

m. Owner prefers to deal with registered supplier/contractor of goods/services under GST. Therefore, bidders are requested to get themselves registered under GST, If not registered yet. However, in case any unregistered bidder is submitting bid, their prices will be loaded with applicable GST while evaluation of bid as per evaluation methodology of tender document. However, where Owner is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.

n. In case of foreign bidders, for supervision/site-work/training, services provided by foreign bidder at project site, GST shall be paid by Owner directly to appropriate Government Tax Authorities, under Reverse Charge Mechanism, if applicable and prices of such services will be loaded with applicable GST while evaluation of bid as per clause E (Evaluation Methodology).

o. Bidder will be required to quote applicable tax rate (along with applicable HSN/SAC Code) as per provisions of GST Laws for all the line items forming part of the enquiry. Any higher rate of tax actually invoiced in excess of quoted rate of tax (except in compliance with provisions of Statutory Variation clauses) shall be adjusted in basic price.

p. In case of delay in supply/execution of contract, supplier/contractor shall be liable to raise invoices for reduced value as per Price Reduction Schedule (PRS) provision of the bidding document. In case the supplier/contractor raises invoices for full value, then supplier/contractor shall issue Credit Note,

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in the form and manner prescribed under relevant GST Act read with Rules thereunder, towards applicable PRS amount with applicable GST thereon.

In case supplier/contractor fails to submit invoices with reduced value or does not issue Credit Note as mentioned above, Owner shall release payment to the supplier/contractor after giving effect to the PRS clause with corresponding reduction in taxes from invoice(s) of supplier/contractor.

In case any financial implication arises on Owner due to issuance of invoice without reduction in prices or non-issuance of Credit Note by supplier/contractor, the same shall be to the account of supplier/contractor. Owner shall be entitled to recover the amount of such financial implication paid or becoming payable by Owner together with penalty and interest thereon, if any.

q. E-way bills shall be issued directly by supplier/contractor in all cases except in cases of direct imports by Owner where E-way bill shall be issued by Owner.

r. In case of applicability of any recovery as per provisions of the contract, Owner shall raise `Invoice on supplier/contractor after charging GST at applicable rates as per prevailing provisions of GST Laws.

2. IMPORT DUTIES

a. Direct supplies by foreign supplier where, Owner becomes consignee

i. Consignee shall be Owner, bill of entry shall be filed by Owner, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be paid by Owner.

b. Imported supplies by Indian suppliers as built in import content where Suppliers/Contractors will become consignee of the goods or by filling Bill of Entry for Home consumption

i. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall be included in the quoted prices by the bidder (considering the input tax credit of IGST, GST Compensation Cess on imported material) and supplier/contractor shall be responsible for the timely payment of the custom duties to the relevant government authority. All harbor dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account.

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ii. Bidder to indicate, in relevant price schedule, CIF value of built-in import content and applicable concessional rate of basic custom duty, Social Welfare Surcharge on custom duty (considering the input tax credit of IGST, GST Compensation Cess on imported material) included in quoted price, in the price schedule.

iii. In case merit rate of custom duty is applicable and bids are invited on the basis of same, however at a later stage concessional rate of custom duty becomes applicable, concessional certificate shall be issued towards import of material against the advance request letter submitted by the domestic bidder and the differential custom duties between concessional rate and quoted merit rate of custom duty by supplier/contractor shall be passed on to the Owner or it shall be recovered by the Owner from the supplier/contractor's invoice.

iv. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials.

v. If bidder does not furnish built in CIF value and rates of custom duty, in that case bidder shall not be entitled to claim any variation in the custom duties even if bidder has quoted their prices considering custom duties.

vi. If custom duty rate actually paid on import of materials and components is found to be lower than the quoted rate of custom duty, then benefit of the same shall be passed on to the Owner.

vii. If bidder has considered Import Duty other than Merit Rate of Import Duty then statutory variation on the Import Duty shall be payable extra on the Merit Rate of Import Duty or the rate of Import Duty considered by the bidder, whichever is lower.

viii. In case, no import is made for execution of the order, clauses related to Imports will not be applicable.

c. General points:

i. In case Owner is exposed to any penal action, interest /penalties by the custom authorities for incorrect declaration and / or valuation of the goods or material by the supplier/contractor, or otherwise on account of any breach of applicable laws in the course of the import of the goods and material by supplier/contractor, the supplier/contractor shall indemnify and hold harmless the Owner for any and all costs, expenses or losses suffered or incurred by Owner in this regard

ii. If bidder intends to source import of goods from a country with which India has Free Trade Agreement (FTA) or Comprehensive Economic Partnership Agreement (CEPA) or any such multi-lateral / bi-lateral Agreement or Treaty with India or under Generalized System of Preference (GSP); or under any other notification (allowing lower rate

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of custom duty), then the bidder is advised to ascertain and confirm its applicability along with supporting documents in the bid and ensure that conditions of such agreement/treaty etc. are strictly complied with.

iii. The bidder shall be liable to provide all documentation to ensure availment of the exemption/waiver. In case the bidder defaults on this due to any reason, whatsoever, he shall be liable to bear the incremental custom duty applicable if any

iv. Any additional custom duty applicability on account of any change in the notification (allowing lower rate of custom duty)/ CEPA/FTA/multi-lateral/bi-lateral trade agreement shall be to bidder's account.

v. Documentation to be furnished for availing the exemption/waiver of custom duty shall be specifically listed in the letter of credit also as a prerequisite for release of payment against shipping documents and this documentation shall necessarily form a part of shipping documents.

vi. Owner will not bear any liability towards payment of Safeguard Duty, Anti-Dumping Duty, Protective Duty and applicable IGST including GST Cess on same or Countervailing Duty on subsidized articles or any other such duties of Customs imposed by Government under Customs Tariff Act, 1975.

vii. In case custom duty rate as quoted by Foreign bidder is less than Actual rate applicable on due date of submission of last price bid and payment of custom duty is on Owner's Account, differential amount on account of above-mentioned rate variation will be recovered from Foreign bidder.

3. INCOME TAX

a. Foreign supervisors/suppliers/contractors

Prices of site work, contracts and other services of foreign supplier/contractor shall be gross of income tax i.e., inclusive of Indian income tax at the applicable prevailing rate as per Indian Income Tax Act and Rules there under.

Owner shall deduct withholding tax at source (TDS) as applicable while making payments against each invoice. Certificate for TDS shall be provided to the supplier/contractor.

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In case foreign bidder quotes Prices of site work, contracts and other services "net of Income Tax" i.e., exclusive of Indian income tax, Owner shall deduct and deposit TDS as applicable after grossing up the sums due while making payments against each invoice at the applicable prevailing rate as per Indian Income Tax Act and Rules thereunder.

Foreign bidder shall furnish the information required in line with the prevalent provisions of Income tax act read with rules thereunder including but not limited to Tax residency certificate, Form 10F, No permanent establishment declaration, No business connection certificate, PAN in India if available or In lieu of PAN declaration.

Failing to provide above documents/information, tax will be withheld at rates applicable as per the provisions of Income Tax Act, 1961 read with rules thereunder and the benefit of reduced rates will not be given.

If the non-resident is unable to obtain & submit Tax Residency Certificate to the Owner within a reasonable time, the bidder should furnish Form 10F along with an undertaking to the effect that the bidder is a tax resident of (the specified country) and that they shall obtain and provide the tax residency certificate (TRC) to the Owner before 30 days of submission of first Invoice by them or within 3 months from the date of entering into contract whichever is earlier.

In case of contracts with term exceeding one financial year, the relevant documents like TRC, Form 10 F, No PE / Business Connection Certificate etc. as applicable, as per Income Tax Act, 1961 must be submitted at the beginning of each financial year and the Owner will not bear additional tax liability (if any) arising from non-submission of documents.

The bidder shall be liable to intimate the subsequent changes (if any) to the information submitted against any of the above particulars, along with full details.

In addition to the above particulars, the bidder should also provide any other information as may be required at a later stage for determining the taxability of the amount to be remitted to the non-residents.

In case, any additional tax liability arises on the Owner due to any action of bidder like delay in submission / non-submission of information / documents required as above or change in residential status post submission of documents or change in any document (like TRC, Form 10F etc.) after its submission shall be recovered from the supplier/contractor.

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b. Indian resident supervisors/ suppliers/contractors

Prices for supply and services of Indian suppliers/ contractors shall be inclusive of income tax.

Tax shall be deducted at source (TDS) by Owner on all sums due to supplier/contractor in accordance with the provisions of Indian Income Tax act read with rules thereunder as in force at the relevant point of time.

Owner shall issue a Tax Deduction Certificate to the supplier/contractor evidencing the tax deducted or withheld and deposited by Owner on payments made to the supplier/contractor to enable the supplier/contractor to claim the credit of Tax deducted by Owner.

c. INCOME TAX (General Points):-

i. The supplier/contractor shall also be responsible for ensuring compliance with all applicable provisions of the Direct Tax Laws of India including, but not limited to, the filing of relevant Tax Returns and shall promptly provide all information required by the Owner for discharging any of its responsibilities/liabilities under such laws in relation to or arising out of the Contract. For the lapses/failure, if any, on the part of the supplier/contractor and consequential penal action taken by the Income Tax department, Owner shall not take any responsibility whether financial or otherwise and shall be indemnified by the supplier/contractor.

ii. The Indian Income Tax Act and Rules made thereunder contains provisions permitting deduction of tax at source (TDS) at lesser rate if the supplier/contractor is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the Owner with the Income Tax Authorities in India and will not be adjustable by the Owner. It is therefore in the interest of the supplier/contractor that prior to release of any payment due to the supplier/contractor under the Contract that the supplier/contractor obtains from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction/withholding of Income tax at source, failing which, payment to the supplier/contractor shall be made by the Owner after withholding/deduction at the rate as may be applicable to the supplier/contractor as per provisions of Income Tax Act, 1961.

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iii. TDS on interest recovered on Mobilization/Other Advance will be deposited by the supplier/contractor and same would be reimbursed by the Owner against submission of Form-16A (TDS certificate).

C. INVOICING METHODOLOGY W.R.T. TAXATION

Unless otherwise stated, following invoicing methodology shall be followed:

1. In case of domestic / foreign PO's (Other than 2 below) , Invoice/E-Invoice shall be raised by the supplier/contractor in the name of Owner and consignee shall be Owner.
2. In case of package MR's (where title transfer or take over is envisaged to take place at site after completion of site work) and tenders, supplier/contractor shall bring material at project site in their own name and they themselves shall be consignee. As per provisions of contract between Owner and supplier/contractor, Invoice/E-Invoice shall be raised by supplier/contractor to Owner after charging GST.

D. APPLICABILITY OF TAX CREDIT

For supplies, services and works contract carried out for PP exclusively, ITC on account of GST is 100%

For supplies, services and works contract carried out for PFCCU Revamp, ITC on account of GST is 16%

E. EVALUATION METHODOLOGY W.R.T. TAXES- **Refer BDS**

Following shall be loaded for evaluation:

1. Applicable Custom Duty, Social Welfare Surcharge etc, (excluding IGST & GST Compensation Cess (if applicable) on imported material which shall be dealt as per bid evaluation methodology given in E2 below) shall be loaded for price bid evaluation in respect of supplies for which bill of entry has to be filled by Owner.
2. GST on which input credit is not available to Owner including GST Compensation Cess (if applicable).
3. Applicable Income tax, in case foreign bidder quotes prices net of taxes.

F. TAXATION TERMS FOR INDIAN SOURCED SUPPLIES (Applicable in case of foreign supplier)

Shall be the same as applicable for Indian bidders.

G. TAX IMPLICATION WHERE FABRICATION YARD IS OUTSIDE THE FACTORY PREMISES, WHEREVER APPLICABLE

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In case of package MRs and tenders, since contractors/suppliers shall bring material at project site in their own name and raise invoice to Owner (as per payment

milestone achieved) after charging GST, location of fabrication yard whether inside or outside factory premises will not attract any additional liability.

H. TAX IMPLICATION WHERE OWNER WILL ISSUE FREE ISSUE MATERIAL (FIM) TO CONTRACTORS/SUPPLIERS

Where Owner issues FIM's to suppliers/contractors, material will be released against delivery challan and such FIM shall be received back in factory premises as per provision of GST.

I. STATUTORY VARIATION (IN CASE OF MRS & TENDERS)

No variation on account of taxes and duties, statutory or otherwise, shall be payable to Supplier/Contractor except for the following:

1. GST: If after the due date of submission of last price bid and upto the contractual delivery/completion period (*Note 1), any increase/decrease occurs in the applicable rate of GST, the variation in such GST shall be to Owner's account and shall be adjusted (increase / decrease) to / from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in GST after the contractual delivery/completion period (*Note 1) shall be to Supplier's/Contractor's account. However, any decrease in the rate of GST shall be passed on to Owner.

   For calculating Statutory Variations ceiling amount as declared by the Bidder in price schedule shall only be considered.

2. Basic Custom Duty (BCD) & Social Welfare Surcharge (SWS): If after the due date of submission of last price bid and upto the 3/4th period of contractual delivery/completion period (*Note 1), any increase/decrease occurs in the applicable rate of BCD & SWS on materials imported, the variation in such BCD & SWS shall be to Owner's account and shall be adjusted (increase/decrease) to/from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in rate of BCD & SWS on materials imported after the 3/4th period of the contractual delivery/completion period (*Note 1) shall be to Supplier's/Contractor's account. However, any decrease in the rate of BCD & SWS on materials imported shall be passed on to Owner.

   For calculating Statutory Variations in BCD/SWS, ceiling amount of CIF Value and rate of custom duty as declared by the Bidder in relevant price schedule shall only be considered.

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Note: Indian supplier/contractor to consider input tax credit of IGST and GST Compensation Cess if any (in case of import of raw Materials / components) in their quoted prices. Hence, Statutory variations on same in case of imported materials from outside India in Supplier's/Contractor's name (i.e., for Indian Bidders) shall be to Supplier/Contractor account.

3. Any new output taxes, duties, cess, levies notified or imposed after the due date of submission of last price bid but upto the contractual date of delivery/completion (*Note 1) shall be to Owner's account. These shall be reimbursed against documentary evidence. However, in case of delay attributable to supplier/contractor, any new output taxes, duties, cess, levies notified or imposed after Time for Completion, defined as above, shall be to supplier's/Contractor's account.

J. TAX INDEMNITY

Any omission/ errors of interpretation of applicability of taxes, duties, cesses and levies, whatsoever named, howsoever named, as are payable to any government, local or statutory authority in India or in any country other than India by the supplier/contractor shall be to supplier's/contractor's account.

If any fine/penalty/any other levy is required to be met by the Owner arising out of any non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be recovered from any amount payable to the supplier/contractor under this contract or under any other contract of the Owner.

If any tax is paid / required to be paid by supplier/contractor in pursuance of any demand of any law enforcement agency/Tax Authority on account of non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be to supplier's/contractor's account only.

1. *Note-1 Contractual delivery/completion period shall include extended contractual delivery/completion period for the reasons attributable to Owner or due to Force Majeure condition.

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<On Bidder Entity's Letterhead>

Annexure-A

Declaration for Non-Applicability of E-Invoicing

We, **<Name of Bidder entity>**, a *Proprietorship firm / Partnership firm / Company, having its registered office at **<address>**, having PAN No. _____and GSTN No._____, hereby declare that we are not required to comply with e-invoicing provisions under GST.

We also hereby declare that we will update ENGINEERS INDIA LIMITED/OWNER (herein after referred to as EIL/Owner) in case there is any change in the above details or in case we are required to adhere to e-invoicing provisions under GST due to any subsequent change in law. In such case, we shall comply with provisions of e-invoicing regime as and when the same becomes applicable to us.

We hereby declare the above statement is true and correct and we shall indemnify and hold EIL/Owner good for any demand, credit reversal, denial of refund, loss, interest or penalty, suit, action, costs and expenses whatsoever (including attorneys' fees and associated legal costs) which may be commenced against and/or incurred by EIL/Owner due to any incorrect declaration or non-compliance by us and EIL/Owner shall have the right to withhold or recover any such loss/cost/expense from any amount payable to us.

<Name and signature of authorized signatory >

For <Name of Bidder Entity>

<Bidder Entity's Seal/Stamp>

<Date>

*Delete whichever is not applicable.

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BIDDING DOCUMENT

FOR

MISC. BUILDING WORKS

(BIDDING DOCUMENT NO.: SS/ B895-999-CF-T-8202/1018)

PROJECT: POLYPROPYLENE PROJECT-KOCHI REFINERY

CLIENT: M/s BHARAT PETROLEUM CORPORATION LIMITED

PART-II OF III : PRICED PART

SCHEDULE OF RATES

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 including scope of work, scope of supply and technical specification 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 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 unprice part.

8.0 The quoted price 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 Bidders shall quote their prices as percentage variation in Form SP-0 on Total estimated value in BoQ1 Sheet of Price Schedule. This percentage variation as quoted by the bidder will apply uniformly to all items of SOR during execution.

11.0 Bidder shall indicate only the Increase/Decrease on Total estimated value in terms of percentage upto 2 decimal places in the “SUMMARY OF PRICES [FORM SP-0]" i.e., Sheet BoQ1. Bidder shall not change the Pre-filled rate/ amount indicated in ‘Schedule of Rates’.

12.0 Bidder shall be presumed to have quoted against the tendered description of work as per the detailed Schedule of Rates (Form SP-2) and the same shall be binding on the Bidder. In case of any discrepancy in description of Item mentioned in Form SP-1(Pre filled Schedule of Rates) and Form SP-2 (detailed Schedule of Rates), description of Item as mentioned in Form SP-2 (Detailed Schedule of Rates) shall prevail.

13.0 The Quoted Price shall remain firm and fixed till the completion of Work in all respects and no escalation in prices on any account shall be admissible to the Contractor except for the provisions indicated in the Bidding Document. The Bids of all such bidders not complying this requirement shall not be accepted.

14.0 EIL 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.

(SIGNATURE & STAMP OF BIDDER)

FORM SP-0

Validate Print Help

Percentage BoQ

Tender Inviting Authority: EIL

Name of Work : MISC. BUILDING WORKS

Bidding Document No.: SS/B895-999-CF-T-8202/1018

Name of the Bidder/ Bidding Firm / Company :	

SUMMARY OF PRICE [FORM SP-0]

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. 5 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 (-)]"

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	Estimated Rate in Rs. P	TOTAL AMOUNT Without Taxes in Rs. P	TOTAL AMOUNT In Words
1	2	3	4	5	6	7
1	**MISC. BUILDING WORKS (BIDDING DOCUMENT NO.: SS/B895-999-CF-T-8202/1018) (For details refer pre-filled rate as per Form SP-1)**	1.00	Lumpsum	227654032.00	**227654032.00**	INR Twenty Two Crore Seventy Six Lakh Fifty Four Thousand &Thirty Two Only
Total in Figures					**227654032.00**	INR Twenty Two Crore Seventy Six Lakh Fifty Four Thousand &Thirty Two Only
	Percentage increase/ decrease on Total estimated cost as stated in COL.6 above, applicable uniformly on all items of pre-filled SOR		**Select**		**0.00**	INR Zero Only

Name of Work: **MISC. BUILDING WORKS**

Bidding Document No.: **SS/B895-999-CF-T-8202/1018**

FORM SP-1

(PRE FILLED SCHEDULE OF RATES)

SCHEDULE OF RATES

BIDDIN
BIDDEI
JOB NC B895
TENDE MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI
CLIENT BPCL - KOCHI REFINERY
PROJE PMC & EPCM Services for PPU & Revamp of PRFCC at Kochi Refinery

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

Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
1	01EE	ELECTRICAL WORKS				
2	01EE.1040	MISCELLANEOUS CONTROL GEAR				
3	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.				
4	01EE.1040.10.10	Weight of the unit up to 5 kg.	16	nos	700	11 200
5	01EE.1040.10.20	Weight of the unit above 5 kg. but upto 20 kg.	2	nos	1 300	2 600
6	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.				
7	01EE.1040.20.20	With start and stop (latching type) push buttons.	8	nos	3 570	28 560
8	01EE.1060	PLUGS, SOCKETS AND JUNCTION BOXES				
9	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.				
10	01EE.1060.10.40	63 A, 415 V, 5 pin sockets along with associated 5 pin plugs.	8	nos	21 250	1 70 000
11	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.				
12	01EE.1060.30.70	240 V, 15 A, 3 pin socket.	25	nos	5 360	1 34 000
13	01EE.1060.30.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.30.70	25	nos	3 150	78 750
14	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.				

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

Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
15	01EE.1060.40.70	FLP (II C) and WP 3 way JB complete with 3 Nos. FLP (II C) cable glands and 1 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	25	nos	12 420	3 10 500
16	01EE.1090	CANOPIES				
17	01EE.1090.50	Supply, fabrication and installation of GI 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.				
18	01EE.1090.50.10	Lighting Panel/Power panel/distribution junctions boxes.	2	nos	3 200	6 400
19	01EE.1090.50.30	Push button stations.	2	nos	3 200	6 400
20	01EE.1100	ANCHOR FASTENERS				
21	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.				
22	01EE.1100.10.10	3/16" BSW.	10	nos	100	1 000
23	01EE.1100.10.20	5/16" BSW.	10	nos	110	1 100
24	01EE.1100.10.30	1/4" BSW.	10	nos	110	1 100
25	01EE.1100.10.40	3/8" BSW.	10	nos	150	1 500
26	01EE.1100.10.50	5/8" BSW.	10	nos	190	1 900
27	01EE.1100.10.60	1/2" BSW.	10	nos	192	1 920
28	01EE.2010	SUPPLY OF MV CABLES				
29	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.				
30	01EE.2010.30.20	3 C x 2.5 sq. mm	500	m	150	75 000
31	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.				
32	01EE.2010.50.190	3.5 C x 35 sq. mm	50	m	200	10 000
33	01EE.2010.50.230	3.5 C x 50 sq. mm	50	m	270	13 500
34	01EE.2040	LAYING OF CABLES				

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

Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
35	01EE.2040.20	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, trefoil clamps (for single core cables) 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				
36	01EE.2040.20.10	Cables with OD upto 20 mm.	2500	m	30	75 000
37	01EE.2040.20.20	Cables with OD above 20 mm but upto 30 mm.	50	m	40	2 000
38	01EE.2050	END TERMINATIONS				
39	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.				
40	01EE.2050.100.10	Cables with OD upto 20 mm.	25	nos	210	5 250
41	01EE.2050.100.20	Cables with OD above 20 mm but upto 30 mm.	25	nos	300	7 500
42	01EE.2050.100.30	Cables with OD above 30 mm but upto 40 mm.	10	nos	370	3 700
43	01EE.2070	G.I. & PVC PIPES				
44	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.				
45	01EE.2070.10.20	50 mm NB.	25	m	960	24 000
46	01EE.2070.10.50	100 mm NB.	200	m	2 730	5 46 000
47	01EE.2070.10.70	150 mm NB.	50	m	4 650	2 32 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
48	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.				
49	01EE.2070.20.20	50 mm NB.	25	m	210	5 250
50	01EE.2070.20.50	100 mm NB.	25	m	760	19 000
51	01EE.2070.20.70	150 mm NB.	25	m	1 770	44 250
52	01EE.2080	STRUCTURAL STEEL				
53	01EE.2080.20	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 Table-10 of specification 6-79-0020 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 1 kg. or less shall neither be measured nor paid).	900	kg	140	1 26 000
54	01EE.2080.40	Supply and installation of supports for push button stations, Fire Alarm BGU/MCPs, etc., complete with base plate, foundations bolts, grouting and painting(as per Table-10 of specification 6-79-0020 suitable for highly corrosive environment) etc., including all labour and materials, as per approved drawings and directions of Engineer-in-Charge.				
55	01EE.2080.40.20	As per std. 7-51-0307	1	nos	3 260	3 260
56	01EE.2090	CABLE - TRAYS				
57	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.				
58	01EE.2090.10.10	300 mm wide Straight run cable tray.	300	m	1 080	3 24 000
59	01EE.2090.10.570	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	2	nos	2 910	5 820
60	01EE.2090.10.610	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius	2	nos	3 020	6 040

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
61	01EE.2090.10.650	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius	2	nos	2 700	5 400
62	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.				
63	01EE.2090.30.10	100 mm wide.	450	m	570	2 56 500
64	01EE.2090.30.20	150 mm wide.	230	m	760	1 74 800
65	01EE.2090.30.30	60 mm wide.	230	m	330	75 900
66	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.	25	m²	1 740	43 500
67	01EE.2090.100	Providing and fixing 1.6mm thick GI fabricated raceways in partition include providing removable 3mm thick cover with knockout holes and fixing accessories, earthing connectivity for the complete length, including floor / wall supports, access boxes as per specification and cross over as per site requirement.				
68	01EE.2090.100.10	300X40X1.6/3MM	50	m	2 320	1 16 000
69	01EE.2090.100.20	250X40X1.6/3MM	50	m	1 940	97 000
70	01EE.2090.100.30	200X40X1.6/3MM	50	m	1 550	77 500
71	01EE.2090.100.40	150X40X1.6/3MM	50	m	1 200	60 000
72	01EE.2090.110	Providing and fixing 2 mm thick G.I. fabricated junction box in raceways include providing removable 3mm thick cover with knockout holes and fixing accessories, earthing connectivity for the box, including floor / wall supports, access boxes as per specification and cross over as per site requirement.				
73	01EE.2090.110.10	350X350X50X2/3MM (with GI Cover)	5	nos	4 100	20 500
74	01EE.2090.110.20	300X300X50X2/3MM (with GI Cover)	5	nos	3 000	15 000
75	01EE.2090.110.30	250X250X50X2/3MM (with GI Cover)	5	nos	2 200	11 000
76	01EE.2090.110.40	200X200X50X2/3MM (with GI Cover)	5	nos	1 450	7 250
77	01EE.2100	CABLE GLANDS				
78	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.				
79	01EE.2100.10.10	Cables with OD upto 20 mm.	10	nos	360	3 600

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
80	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.				
81	01EE.2100.20.10	Cables with OD upto 20 mm.	10	nos	460	4 600
82	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.				
83	01EE.2100.40.10	Cables with OD upto 20 mm.	30	nos	170	5 100
84	01EE.2100.40.20	Cables with OD above 20 mm but upto 30 mm.	20	nos	280	5 600
85	01EE.2100.40.30	Cables with OD above 30 mm but upto 40 mm.	10	nos	520	5 200
86	01EE.2120	CABLE LUGS				
87	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.				
88	01EE.2120.10.10	All sizes upto 10 sq. mm	10	nos	30	300
89	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.				
90	01EE.2120.20.20	All sizes from 16 to 35 sq. mm	10	nos	30	300
91	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.				
92	01EE.2120.30.20	All sizes from 16 to 35 sq. mm	10	nos	40	400
93	01EE.2120.30.30	All sizes from 50 to 185 sq. mm	5	nos	260	1 300
94	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.				
95	01EE.2120.40.10	All sizes upto 10 sq. mm	5	nos	40	200
96	01EE.2120.40.20	All sizes from 16 to 35 sq. mm	5	nos	70	350
97	01EE.3030	HAZARDOUS AREA LIGHTING FIXTURES AND ACCESSORIES				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
98	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.				
99	01EE.3030.10.30	Well glass type bracket mounted.	75	nos	610	45 750
100	01EE.3030.10.40	Well glass type ceiling mounted.	50	nos	610	30 500
101	01EE.3030.10.60	Flood light fixtures.	6	nos	1 100	6 600
102	01EE.3030.10.70	3-way, junction box.	6	nos	490	2 940
103	01EE.3030.10.110	Tube light type, column/ceiling mounted	20	nos	1 100	22 000
104	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.				
105	01EE.3030.20.MA01	Type FLP IIC-10 Fixtures	20	nos	25 000	5 00 000
106	01EE.3030.20.520	Type FLP-LED-1 Fixtures.	50	nos	4 090	2 04 500
107	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.	50	nos	940	47 000
108	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.	50	nos	940	47 000
109	01EE.3040	SAFE AREA LIGHTING FIXTURES				
110	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.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
111	01EE.3040.20.210	Type LED 2 Fixtures.	400	nos	6 090	24 36 000
112	01EE.3040.20.220	Type LED 3 Fixtures.	30	nos	2 100	63 000
113	01EE.3040.20.350	Type LED IND-1 Fixtures.	250	nos	1 180	2 95 000
114	01EE.3040.20.360	Type LED IND-2 Fixtures.	100	nos	1 466	1 46 600
115	01EE.3040.20.450	Type LED RSD-10 Fixtures.	25	nos	2 500	62 500
116	01EE.3040.20.460	Type LED SFD-12 Fixtures.	25	nos	2 500	62 500
117	01EE.3040.20.470	Type LED LB-1 Fixtures.	5	nos	14 600	73 000
118	01EE.3040.20.480	Type LED HB-1 Fixtures.	3	nos	19 900	59 700
119	01EE.3040.20.510	Type LED BK-2 Fixtures.	10	nos	2 240	22 400
120	01EE.3040.20.550	Type LED ST-4 Fixtures.	25	nos	11 160	2 79 000
121	01EE.3040.20.580	Type LED FD-1 Fixtures.	12	nos	14 340	1 72 080
122	01EE.3050	FANS AND EXHAUST FANS				
123	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.				
124	01EE.3050.10.10	300 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos	4 850	24 250
125	01EE.3050.10.20	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos	6 700	33 500
126	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	8 100	40 500
127	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	3 230	16 150
128	01EE.3070	SOCKETS / RECEPTACLES AND SWITCHES / MCB UNITS				
129	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.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
130	01EE.3070.10.20	6 A, 3 pin plate type flush/ surface mounting sockets/receptacles.	50	nos	320	16 000
131	01EE.3070.10.40	16/6 A, 6 pin plate type flush/ surface mounting sockets/receptacles.	65	nos	500	32 500
132	01EE.3070.10.60	20 A, 3 pin surface mounted industrial type switch socket with plug and sheet steel painted box.	25	nos	2 140	53 500
133	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.				
134	01EE.3070.20.20	6 A, plate type flush/surface mounted switches.	200	nos	280	56 000
135	01EE.3070.20.40	16 A, plate type flush/surface mounted switches.	75	nos	330	24 750
136	01EE.3070.20.60	32A, DP MCB unit in moulded case enclosure for window / split type air conditioner.	10	nos	2 400	24 000
137	01EE.3080	JUNCTION BOXES (OUTDOOR / INDOOR TYPE)				
138	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.				
139	01EE.3080.10.10	3 way.	10	nos	2 680	26 800
140	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.				
141	01EE.3080.20.10	Junction box.	5	nos	3 210	16 050
142	01EE.3090	LIGHTING / POWER PANELS AND DISTRIBUTION BOARDS				
143	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.				
144	01EE.3090.10.MA01	40 A, 4 pole incomer MCB isolator and 06 Nos.outgoing double pole MCBs (upto 20A) and Type-A RCCB (Sensitivity-30 mA) including supply of cable glands and lugs	5	nos	31 600	1 58 000
145	01EE.3090.10.MA02	40 A, 4 pole incomer MCB isolator and 12 Nos.outgoing double pole MCBs (upto 20A) and Type-A RCCB (Sensitivity-30 mA) including supply of cable glands and lugs	5	nos	49 900	2 49 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
146	01EE.3090.10.MA03	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing double pole MCBs (upto 20A) and Type-A RCCB (Sensitivity -30 mA) including supply of cable glands and lugs	6	nos	69 000	4 14 000
147	01EE.3090.10.MA04	63 A, 4 pole incomer MCB isolator and 6 Nos. outgoing 32A single pole MCBs and Type-A RCCB (Sensitivity -30 mA) in each outgoing circuit including supply of cable glands and lugs	10	nos	35 000	3 50 000
148	01EE.3100	WIRING				
149	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.				
150	01EE.3100.30.10	3 Nos x 1.5 sq. mm	500	m	100	50 000
151	01EE.3100.30.20	3 Nos x 2.5 sq. mm	800	m	120	96 000
152	01EE.3100.30.30	5 Nos x 1.5 sq. mm	700	m	120	84 000
153	01EE.3100.30.40	5 Nos x 2.5 sq. mm	250	m	160	40 000
154	01EE.3100.30.50	7 Nos x 1.5 sq. mm	125	m	180	22 500
155	01EE.3100.30.60	7 Nos x 2.5 sq. mm	125	m	240	30 000
156	01EE.3100.30.80	3 Nos x 4 sq. mm	100	m	190	19 000
157	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.				
158	01EE.3100.70.10	25 mm diameter.	700	m	170	1 19 000
159	01EE.3100.70.20	40 mm diameter.	500	m	330	1 65 000
160	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.	1400	m	650	9 10 000
161	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.				
162	01EE.3100.90.10	1.5 sq. mm wires.	7000	m	40	2 80 000

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163	01EE.3100.90.20	2.5 sq. mm wires.	400	m	80	32 000
164	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.				
165	01EE.3100.100.10	25 mm diameter.	900	m	90	81 000
166	01EE.3100.100.20	40 mm diameter.	450	m	150	67 500
167	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.				
168	01EE.3100.110.10	3 C x 2.5 sq. mm	450	m	50	22 500
169	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.				
170	01EE.3100.120.10	3 C x 2.5 sq. mm	1400	m	70	98 000
171	01EE.3120	EMERGENCY LIGHTING				
172	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.	10	nos	4 910	49 100
173	01EE.4020	EARTH ELECTRODES				
174	01EE.4020.10	Supply, installation, testing and commissioning of GI earth electrodes, complete with earth pit as per std. 7-51-0102 and all necessary materials including excavation of earth pit, filling with charcoal and salt, back filling, providing necessary brickwork, connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
175	01EE.4020.10.10	GI earth electrode as per std. 7-51-0102.	140	nos	11 300	15 82 000
176	01EE.4030	EARTH STRIPS				
177	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.				
178	01EE.4030.10.20	50 x 6 mm	240	m	390	93 600
179	01EE.4030.10.40	25 x 3 mm	2800	m	170	4 76 000
180	01EE.4030.10.50	100 x 12 mm	240	m	890	2 13 600
181	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.				
182	01EE.4030.20.20	50 x 6 mm	550	m	500	2 75 000
183	01EE.4030.20.40	25 x 3 mm	950	m	280	2 66 000
184	01EE.4030.20.50	100 x 12 mm	1800	m	1 000	18 00 000
185	01EE.4040	EARTHING CONNECTION				
186	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.				
187	01EE.4040.10.10	3/8" dia (10 mm) flexible rope.	5	m	190	950
188	01EE.4040.10.20	5/8" dia (16 mm) flexible rope.	5	m	360	1 800
189	01EE.4040.10.30	8 SWG GI Wire.	5	m	60	300
190	01EE.4050	EARTH PLATES				
191	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.				
192	01EE.4050.10.10	GI earth plate as per std. 7-51-0103.	40	nos	1 080	43 200

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
193	01EE.4100	EARTHING CABLES				
194	01EE.4100.10	Supply of 1100 V grade, multi stranded Aluminium Conductor, 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.				
195	01EE.4100.10.MA03	1 C x 16 Sqmm	1	m	120	120
196	01EE.4100.10.MA04	1 C x 70 Sqmm	1	m	200	200
197	01EE.4100.10.10	1 C x 10 Sqmm	740	m	115	85 100
198	01EE.4100.10.20	1 C x 25 Sqmm	240	m	150	36 000
199	01EE.4100.10.50	1 C x 120 Sqmm	10	m	250	2 500
200	01EE.4100.10.70	1 C x 185 Sqmm	10	m	370	3 700
201	01EE.4100.10.90	1 C x 300 Sqmm	10	m	750	7 500
202	01EE.4100.20	Termination & connection of leads of 1100 V grade, multi stranded Aluminium Conductor, 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				
203	01EE.4100.20.MA01	1 C x 16 Sqmm	2	nos	340	680
204	01EE.4100.20.MA02	1 C x 70 Sqmm	2	nos	340	680
205	01EE.4100.20.10	1 C x 10 Sqmm	25	nos	340	8 500
206	01EE.4100.20.20	1 C x 25 Sqmm	10	nos	340	3 400
207	01EE.4100.20.50	1 C x 120 Sqmm	2	nos	610	1 220
208	01EE.4100.20.70	1 C x 185 Sqmm	2	nos	740	1 480
209	01EE.4100.20.90	1 C x 300 Sqmm	2	nos	1 070	2 140
210	01EE.5010	PLANT COMMUNICATION SYSTEM				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
211	01EE.5010.20	Installation, termination and connection 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.				
212	01EE.5010.20.10	Central Exchange Panel along with associated battery, battery charger.	2	nos	15 160	30 320
213	01EE.5010.20.20	Desk type intercom station upto 24 keys.	1	nos	2 670	2 670
214	01EE.5010.20.30	Desk type intercom station with above 24 and upto 54 Keys.	1	nos	3 040	3 040
215	01EE.5010.20.40	Weather Proof Intercom station with upto 3 Nos dual position Keys (FLP/Industrial type).	15	nos	970	14 550
216	01EE.5010.20.50	Weather proof loudspeakers (FLP/Industrial Type).	15	nos	850	12 750
217	01EE.5010.20.80	Desk type intercom station with above 54 and upto 128 Keys.	1	nos	4 000	4 000
218	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.				
219	01EE.5010.40.10V3	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos	30 160	30 160
220	01EE.5010.40.10V4	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos	35 180	35 180
221	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.				
222	01EE.5010.50.10V2	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos	3 000	3 000
223	01EE.5010.50.10V3	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos	3 000	3 000
224	01EE.5020	TELEPHONE SYSTEM				
225	01EE.5020.10	Supply, installation, testing and commissioning of Indoor Telephone Distribution J.B. 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 Krone type terminals 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.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
226	01EE.5020.10.10V1	TDJB Surface mounting type, suitable for 1 nos 20 Pair incoming cable(s) and 10 nos 2 Pair outgoing cable(s)	5	nos	15 000	75 000
227	01EE.5020.10.10V6	TDJB Surface mounting type, suitable for 1 nos 10 Pair incoming cable(s) and 10 nos 1 Pair outgoing cable(s)	2	nos	10 000	20 000
228	01EE.5020.10.10V21	TDJB Surface mounting type, suitable for 3 nos 50 Pair incoming cable(s) and 15 nos 20 Pair outgoing cable(s)	1	nos	20 000	20 000
229	01EE.5020.20	Supply, installation, connection, testing and commissioning of following plug - in type sockets for Telephones extensions including supply of sheet boxes with covers connection of socket and plug, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.				
230	01EE.5020.20.20	Flush Mounting Type.	20	nos	2 360	47 200
231	01EE.5020.30	Wiring with (No. of wires given below) 660 V grade, 0.63 mm dia. annealed tinned copper conductor, PVC insulated twin flat wire as per relevant IS in already laid surface/concealed conduit from TDJB onwards to telephone sockets including 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.				
232	01EE.5020.30.10	1 No. twin flat wire.	240	m	60	14 400
233	01EE.5020.30.20	2 Nos. twin flat wires.	240	m	70	16 800
234	01EE.5020.30.30	3 Nos. twin flat wires.	240	m	80	19 200
235	01EE.5020.30.50	5 Nos. twin flat wires.	50	m	120	6 000
236	01EE.5030	FIRE ALARM SYSTEM				
237	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.				
238	01EE.5030.20.MA01	Zener Barrier	20	nos	700	14 000
239	01EE.5030.20.10	Fire alarm panel.	2	nos	18 000	36 000
240	01EE.5030.20.20	Zonal/Repeat fire alarm panels.	1	nos	18 000	18 000
241	01EE.5030.20.50	Heat detectors.	75	nos	490	36 750
242	01EE.5030.20.100	Break glass type fire alarm boxes.	40	nos	900	36 000
243	01EE.5030.20.120	Exit signs.	60	nos	420	25 200

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244	01EE.5030.20.140	Hooters.	25	nos	420	10 500
245	01EE.5030.20.150	Sirens with starters.	2	nos	1 100	2 200
246	01EE.5030.20.160	Multi sensor type detectors	300	nos	500	1 50 000
247	01EE.5030.20.170	Fault Isolator modules	40	nos	650	26 000
248	01EE.5030.20.180	Input/Monitoring relay module	10	nos	750	7 500
249	01EE.5030.20.190	Output/Control Relay Module	10	nos	750	7 500
250	01EE.5030.20.200	Hooter Acknowledge Box	15	nos	750	11 250
251	01EE.5030.30	Supply of weatherproof type fire alarm junction box (FAJB) 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.				
252	01EE.5030.30.10V4	FAJB with 6 nos 2 Pair incoming cable(s) and 6 nos 2 Pair outgoing cable(s)	1	nos	10 000	10 000
253	01EE.5030.30.10V6	FAJB with 4 nos 2 Pair incoming cable(s) and 4 nos 2 Pair outgoing cable(s)	4	nos	9 000	36 000
254	01EE.5030.30.10V20	FAJB with 3 nos 10 Pair incoming cable(s) and 15 nos 2 Pair outgoing cable(s)	1	nos	15 000	15 000
255	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.				
256	01EE.5030.40.10V4	FAJB with 6 nos 2 Pair incoming cable(s) and 6 nos 2 Pair outgoing cable(s)	1	nos	1 500	1 500
257	01EE.5030.40.10V6	FAJB with 4 nos 2 Pair incoming cable(s) and 4 nos 2 Pair outgoing cable(s)	4	nos	1 350	5 400
258	01EE.5030.40.10V19	FAJB with 3 nos 10 Pair incoming cable(s) and 15 nos 2 Pair outgoing cable(s)	1	nos	2 250	2 250
259	01EE.5040	LAYING OF COMMUNICATION / FIRE ALARM CABLES				
260	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				
261	01EE.5040.10.10	Cables of overall dia. upto 35 mm.	5000	m	40	2 00 000
262	01EE.6010	CIVIL WORKS/M.S. CHEQUERED PLATE				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
263	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.				
264	01EE.6010.60.10	6 mm thick M.S. chequered plate.	5	m²	5 790	28 950
265	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.				
266	01EE.6010.90.20V1	Rectangular Cut Out of length 200 mm width 200 mm	5	nos	1 320	6 600
267	01EE.8010	LAN SYSTEMS				
268	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.				
269	01EE.8010.10.10	32A, double pole incomer MCB isolator and 6 nos outgoing double pole 10A MCBs isolator with 2nos, 10A semiconducting fuses.	6	nos	12 360	74 160
270	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	15 580	31 160
271	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	1	nos	17 730	17 730
272	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.				
273	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.	40	nos	1 290	51 600
274	01EE.9000	PAINTING & MARKING				
275	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.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
276	01EE.9000.20.10	Each alphabet/character upto 2 inch in height/length	2600	nos	70	1 82 000
277	01EE.9000.20.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	2500	nos	80	2 00 000
278	01EE.9000.20.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	2200	nos	90	1 98 000
279	01EE.MA01	Supply of 1100 V grade, Copper Conductor, 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.				
280	01EE.MA01.03	2 pair x 1.5 sq.mm	5400	m	160	8 64 000
281	01EE.MA01.04	5 pair x 0.9 mm dia.	600	m	120	72 000
282	01EE.MA02	Supply of 1100 V grade, Copper Conductor, Overall shielded, twisted pair/triad, XLPE insulated, Unarmored, 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.				
283	01EE.MA02.03	2 pair x 1.5 sq.mm	80	m	90	7 200
284	01EE.MA02.04	5 pair x 0.9 mm dia.	80	m	80	6 400
285	01EE.MA03	ROOFTOP SOLAR PHOTOVOLTAIC SYSTEM				
286	01EE.MA03.01	Design, Engineering, Supply of grid connected rooftop solar photovoltaic power system with minimum generation output of minimum 20 kWp at the point of common coupling with main junction box supplied by vendor in GATE HOUSE. From Main Junction box in GATE HOUSE to further connection to Owner's switchboard in SS-JP1 by others. Supplied solar system shall comprise but not limited to solar PV modules including mounting frames, structures, array foundation, module inter connection etc, Array Junction boxes, Main Junction boxes and Fuse boxes / circuit breakers, Power Conditioning Units (PCU), AC power evacuation panels with bus bars and circuit breakers, Metering and protection / Isolation systems, MV Power and Control Cables including end terminations, cable trays, supports & accessories, Galvanized steel conduits & accessories, PVC pipes, ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes, cable fixing clamps, nuts and bolts, Steel materials for field fabrication etc, other accessories for both AC & DC power as required for interconnection between contractor supplied equipment, Earthing system for PV Array, DC power system, AC power system equipment, PCU etc., Lightning protection system, Data acquisition and monitoring system with remote monitoring facilities etc. as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineer-in Charge.	1	nos	16 90 000	16 90 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
287	01EE.MA03.02	Installation, Testing and commissioning of grid connected rooftop solar photovoltaic power system as per complete MR item 01EE.MA03.01 including Earthing system, Lightning protection system, configuration of Data acquisition and monitoring system with remote monitoring facilities etc and laying and termination of cable within all equipments supplied as a part of this solar system and from PCU/AC Power evacuation panel to 415V Main distribution board in admin building and all other items as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineerin-Charge.	1	Lumpsum	2 46 400	2 46 400
288	01EE.MA03.03	Design, Engineering, Supply of grid connected rooftop solar photovoltaic power system with minimum generation output of minimum 95 kWp at the point of common coupling with Owners switch board in N2 Substation JU1/SRR-12. Supplied solar system shall comprise but not limited to solar PV modules including mounting frames, structures, array foundation, module inter connection etc, Array Junction boxes, Main Junction boxes and Fuse boxes / circuit breakers, Power Conditioning Units (PCU), AC power evacuation panels with bus bars and circuit breakers, Metering and protection /Isolation systems, MV Power and Control Cables including end terminations, cable trays, supports & accessories, Galvanized steel conduits & accessories, PVC pipes, ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes, cable fixing clamps, nuts and bolts, Steel materials for field fabrication etc, other accessories for both AC & DC power as required for interconnection between contractor supplied equipment, Earthing system for PV Array, DC power system, AC power system equipment, PCU etc., Lightning protection system, Data acquisition and monitoring system with remote monitoring facilities etc. as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineer-in Charge.	1	nos	76 01 700	76 01 700
289	01EE.MA03.04	Installation, Testing and commissioning of grid connected rooftop solar photovoltaic power system as per complete MR item 01EE.MA03.03 including Earthing system, Lightning protection system, configuration of Data acquisition and monitoring system with remote monitoring facilities etc and laying and termination of cable within all equipments supplied as a part of this solar system and from PCU/AC Power evacuation panel to 415V Main distribution board in admin building and all other items as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineerin-Charge.	1	Lumpsum	7 45 940	7 45 940
290	01EE.MA04	Supply, installation, connection, testing and commissioning of safe area MCB Box				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
291	01EE.MA04.01	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 Engineeer-in-Charge.	4	nos	8 500	34 000
292	01EE.MA05	OCCUPANCY SENSOR				
293	01EE.MA05.01	Supply, Installation, testing and commissioning of Passive Infrared (PIR) technology based non-regulating programmable type Occupancy sensor having high performance, suitable for connected load up to 10 Amp, for mounting heights up to 4 meter and for 4 meter diameter coverage area along with necessary junction box, wiring, fixing arrangements, and supply of all connected materials, including programming at site, complete with all labor and material as required.	6	nos	6 400	38 400
294	01IT	INFORMATION TECHNOLOGY SERVICES				
295	01IT.20	Structured UTP LAN CABLING				
296	01IT.20.1	Supply, installation, testing (Penta Scanning) and commissioning of Structured UTP LAN Cabling including all labour and materials (Cable, Conduit, Channel), including following items as per approved drawings, specifications of this tender and directions of engineer-in-charge:				
297	01IT.20.1.5	CAT-6A LSZH-FR	2	Box	24 000	48 000
298	01IT.20.1.13	24-port CAT-6A Jack Panel (fully loaded with 24 Nos. I/Os)	1	nos	15 000	15 000
299	01IT.20.1.23	1-m long CAT-6A Patch Cord	15	nos	500	7 500
300	01IT.20.1.24	2-m long CAT-6A Patch Cord	15	nos	750	11 250
301	01IT.20.1.32	CAT-6A I/O, Faceplates, Gang-box	15	nos	1 550	23 250
302	01IT.21	Structured OFC Cabling				
303	01IT.21.1	Supply, installation, testing and commissioning of Structured OFC Cabling including all labour and materials including following items as per approved drawings, specifications of this tender and directions of engineer-in-charge.				
304	01IT.21.1.12	OFC - 6-Core, Single-mode, LSZH, Indoor/Outdoor, Armoured	500	m	150	75 000
305	01IT.21.2	Supply, installation, testing and commissioning of Fiber Optic Patch Panel including all accessories for terminating, Pigtails 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				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
306	01IT.21.2.1	Fiber Optic Patch Panel				
307	01IT.21.2.1.1V1	No. of Cores 12 nos Mode Single-Mode	1	nos	17 000	17 000
308	01IT.21.3	Supply, Installation of LSZH Patch Cord as per the specifications of this tender and directions of the Engineer-in-Charge.				
309	01IT.21.3.1	Fiber Optic Patch cord				
310	01IT.21.3.1.1V1	Type LC-LC Mode Single-Mode	4	nos	5 000	20 000
311	01IT.21.4	Supply, Installation, Laying of pre-lubricated HDPE conduits by direct burial / through cable trays / through ducts / through already available RCC Trench including civil work like weeding out vegetation, excavation upto 1m, conduit laying, pressing and backfilling of soil etc. and laying of OFC in HDPE as per the specifications of this tender and directions of the Engineer-in-Charge				
312	01IT.21.4.1	Pre lubricated HDPE				
313	01IT.21.4.1.1V1	OD 40 mm	400	m	170	68 000
314	01IT.21.5	Supply, installation of OFC joint pits as per the specifications of this tender and directions of the Engineer-in-Charge				
315	01IT.21.5.1	OFC Joint Pits	1	nos	10 000	10 000
316	01IT.21.6	Supply, installation of OFC Building Distribution Enclosure as per the specifications of this tender and directions of the Engineer-in-Charge				
317	01IT.21.6.1	OFC Building Distribution Enclosure	1	nos	56 250	56 250
318	01IT.30	Equipment Rack - Networking, Server				
319	01IT.30.10	Supply, installation, testing and commissioning of Network Racks including all labour and materials (including Horizontal and Vertical Cable Managers) of varying sizes, as per approved drawings, specifications of this tender and directions of engineer-in-charge.				
320	01IT.30.10.2	Wall-mounted Network Rack				
321	01IT.30.10.2.1V2	Height 15 u Width 19 Inch	1	nos	29 000	29 000
322	01IT.37	Supply and Laying of PVC conduits pipe				
323	01IT.37.1	Supply and Laying of PVC conduits as per the specifications of this tender and directions of the Engineer-in-Charge.				
324	01IT.37.1.1V3	Supply and Laying of PVC conduits of sizes OD 32 mm	200	m	160	32 000
325	01IT.39	Supply and Laying of PVC channels				
326	01IT.39.1	Supply and Laying of PVC channels as per the specifications of this tender and directions of the Engineer-in-Charge.				
327	01IT.39.1.1V1	Supply and Laying of PVC channels of size OD 25 mm as per the specifications of this tender and directions of the Engineer-in-Charge.	50	m	200	10 000

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328	01IT.80	Network Active Components				
329	01IT.80.3	Supply, installation, mounting, testing and commissioning of Ethernet Edge Switch(s) including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer in charge				
330	01IT.80.3.1	POE Ethernet Switch				
331	01IT.80.3.1.1V1	Total No. of Gigabit UTP Ports 24 No. of POE Ports 24 No. of Fiber Ports 4	1	nos	3 58 310	3 58 310
332	01IT.80.4	Supply, installation, mounting, testing and commissioning of 10G SFP+ LR including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer in charge				
333	01IT.80.4.1	10G SFP+ LR upto 10 Km	4	nos	4 900	19 600
334	01QQ	EQUIPMENT - PACKAGE				
335	01QQ.MC7	Supply and Installation of Central Air-Conditioning System with Water Cooled Chillers & Chilled Water Coil AHU Design, engineering, procurement of raw materials and bought out components, manufacturing, fabrication, assembly at shop, inspection, testing at manufacturer's works, shop painting (primer + finish coat), packing and delivery including supply of all commissioning spares, mandatory spares, special tools and tackles as applicable, first charge of refrigerant and lubricants for Central AC System with water cooled Chillers & chilled water coil AHUs including all auxiliaries, associated piping, valves/instruments ducting, diffusers/grilles etc., transportation from vendor's works to site, unloading at site, handling, transportation to contractor's store and from contractor's store to work site, storage at site, fabrication/assembly at site, installation and other field works including electrical, civil-structural work complete in all respect, hook up, testing, site painting, insulation, pre-commissioning, commissioning, performance guarantee run test at site, handing over to client, onsite training at project site to Owners personnel for operation & maintenance, preparation and submission of drawings & documents as per the enclosed Scope of Supply/Works (Static & Machinery Equipment, Doc. No. B895-999-80-42-SOW-8202), Job Specification (Static & Machinery Equipment, Doc. No. B895-999-80-42-SP-8202) for Building Works and other documents referred therein and instruction of engineering charge for each equipment including accessories.				
336	01QQ.MC7.1	FOR SUBSTATION JU-1 & SATELLITE RACK ROOM-12	1	Lumpsum	2 09 80 000	2 09 80 000
337	01QQ.MC7.2	FOR PEROXIDE STORAGE BUILDING	1	Lumpsum	1 24 45 000	1 24 45 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
338	01QQ.MC8	Supply and Installation of Free-Standing Floor Mounted Tower Split Air-Conditioning System Supply of Free-Standing Floor Mounted Tower Split Air-Conditioning System each of 3.0TR complete with all accessories and fittings, including supply of first fill of refrigerants (non-CFC and eco-friendly), remote control, transportation from vendor's works to site, unloading at site, handling, transportation to contractor's store and from contractor's store to work site, storage at site, assembly at site, installation and other field works including electrical, civil-structural works complete in all respect, testing, painting, insulation, commissioning, handing over to client. Split unit shall have Floor mounted indoor unit and outside located air cooled condenser (outdoor unit) with insulated refrigerant piping, controls and line accessories, electrical and civil works (e.g. civil work related to concealing of refrigerant piping, drain piping to the nearest drain, cabling of AC units) as required including the structural steel framework, pedestal/bracket to mount the indoor and outdoor units, supports & clamps for refrigerant piping/cables, hold down nuts & bolts, spares for commissioning and start up etc. as per the enclosed Scope of Supply/Works (Static & Machinery Equipment, Doc. No. B895-999-80-42-SOW-8202), Job Specification (Static & Machinery Equipment, Doc. No. B895-999-80-42-SP-8202) for Building Works and other documents referred therein and instruction of engineer-in-charge for each equipment including accessories.				
339	01QQ.MC8.1	FOR SUBSTATION JU-1 & SATELLITE RACK ROOM-12	6	nos	1 98 950	11 93 700
340	01CS	STRUCTURAL				
341	01CS.1	EARTH WORK (REFER SPECIFICATION NO. 6-68-0003)				
342	01CS.1.1	Earthwork excavation in soil				
343	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.	2200	m^3	500	11 00 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
344	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.	2200	m^3	580	12 76 000
345	01CS.1.1.3	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 3.0m and upto & inclusive of 4.5m 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.	600	m^3	670	4 02 000
346	01CS.1.2	Earthwork excavation in soft rock				
347	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.	8	m^3	930	7 440
348	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.	8	m^3	1 180	9 440

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
349	01CS.1.2.3	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 3.0m and upto & inclusive of 4.5m 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.	8	m^3	1 430	11 440
350	01CS.1.4	Earthwork excavation by controlled blasting (Explosive/ Non-explosive)				
351	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.	3	m^3	4 010	12 030
352	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.	3	m^3	4 500	13 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
353	01CS.1.4.13	Earthwork in EXCAVATION below ground level for all kinds of works by Non- Explosive Blasting methods in Hard Rocks, for a depth beyond 3.0m and upto & inclusive of 4.5m 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.	3	m^3	4 670	14 010
354	01CS.1.6	SHORING AND STRUTTING				
355	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.	1	m^2	410	410
356	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.	1	m^2	590	590
357	01CS.1.7	Backfilling after execution of work				
358	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.	750	m^3	430	3 22 500
359	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.	750	m^3	500	3 75 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
360	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.	380	m^3	530	2 01 400
361	01CS.1.10	Transporting & Disposing the SURPLUS EARTH AND DEBRIS				
362	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).	180	m^3	330	59 400
363	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).	180	m^3	350	63 000
364	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).	180	m^3	390	70 200

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
365	01CS.1.10.4	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 5.0 KM AND UPTO ANYWHERE within 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).	30	m^3	410	12 300
366	01CS.2	PLAIN & REINFORCED CEMENT CONCRETE: (REFER SPECIFICATION NO. 6-68-0004)				
367	01CS.2.17	PCC - Non FIM Items				
368	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.	20	m^3	8 000	1 60 000
369	01CS.2.17.2	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, shuttering 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 1:4:8 by mass (1 Cement: 4 Coarse Sand: 8 Crushed Stone Aggregates/Gravels) with 40mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	15	m^3	8 280	1 24 200
370	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	8 830	17 660

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
371	01CS.2.17.6	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 above plinth level as SCREED in floor slabs, roofs, chajjas, canopies, gutters etc. for all heights 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.	25	m^3	10 480	2 62 000
372	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.	25	m^3	9 160	2 29 000
373	01CS.2.18	RCC Substrutures - Non FIM Items				
374	01CS.2.18.17	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	450	m^3	10 790	48 55 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
375	01CS.2.18.22	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	10	m^3	11 330	1 13 300
376	01CS.2.19	RCC Superstructures - Non FIM Items				
377	01CS.2.19.17	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	1550	m^3	12 510	1 93 90 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
378	01CS.2.19.22	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	10	m^3	13 760	1 37 600
379	01CS.2.20	RCC Flooring - Non FIM Items				
380	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.	80	m^3	8 510	6 80 800
381	01CS.2.22	Precast Elements - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
382	01CS.2.22.7	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-30 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 (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.	2	m^3	24 220	48 440
383	01CS.2.23	HYD Bars / MS Bars - Non FIM Items				
384	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.	240	MT	1 02 590	2 46 21 600
385	01CS.2.25	Centering and Shuttering - Non FIM Items				
386	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.	3400	m^2	450	15 30 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
387	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.	4500	m²	1 090	49 05 000
388	01CS.2.26	Expansion joints - Non FIM Items				
389	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.	130	m	630	81 900
390	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.	50	m²	2 370	1 18 500
391	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.	150	m	610	91 500
392	01CS.2.28	Mechanical Rebar Couplers - Non-FIM items				
393	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. "	1	each	320	320
394	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. "	1	each	400	400

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
395	01CS.2.29	Fixing Re-bars in already cast concrete - Non FIM Items				
396	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.	1	each	1 030	1 030
397	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.	1	each	1 110	1 110
398	01CS.4	STRUCTURAL STEEL WORKS SPEC NO. 6-68-0006				
399	01CS.4.3	General Steel Works - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
400	01CS.4.3.13	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) 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.	30	MT	1 37 610	41 28 300
401	01CS.4.3.14	"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) 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	1 47 640	1 47 640

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
402	01CS.4.4	Painting - Non FIM Items				
403	01CS.4.4.10	Supplying and applying FIELD PAINT SYSTEM of approved quality and shade as per Sl. No. 10.2 of Table 10.0 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. 7.2.1 of Table 7.2 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable), for steel structures (excluding ladders, spiral stairways & hand rails) at all location & levels, all complete as specified, in OFFISTE (COASTAL) areas as well as UNIT (INLAND & COSTAL) areas considering environmental classification as INDUSTRIAL MARINE. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on Structural steel weight).	50	MT	14 330	7 16 500
404	01CS.4.4.11	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 8.1 of Table 8.0 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) for painting over the coat of shop primer & galvanisation already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of shop primer coat, for LADDERS, SPIRAL STAIRWAYS & 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).	0.5	MT	8 990	4 495
405	01CS.4.5	Grouting				
406	01CS.4.5.1	Supplying & applying Grouting below the bases of structural steel members with Free-flow Non-shrink Cementitious Grout of approved make.	2	m^3	90 640	1 81 280
407	01CS.5	STRUCTURAL STEEL WORKS (TUBULAR/HOLLOW SECTION) (REFER SPECIFICATION NO.6-68-0007)				
408	01CS.5.5	Yst310 IS1161				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
409	01CS.5.5.1	"Supplying, transporting, storing, fabricating, erecting in position and testing / examining at all locations and levels bolted and/or welded TUBULAR STEEL WORKS of all types using STEEL TUBES OF YST 310 GRADE CONFORMING TO IS:1161 in all types of trusses, girders, purlins, siderails, columns, runners, beams, ties, portals, frame work, bracings, brackets, sagrods 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 Grout/premix free flow Non Shrink Grout as specified, preparation & 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) as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) etc. all complete as specified & directed. SUPPLY OF ALL MATERIALS INCLUDING PLATES IN CONTRACTOR'S SCOPE.	30	MT	1 69 480	50 84 400
410	01CS.5.7	Yst310 IS 4923				
411	01CS.5.7.3	"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-310 of approved make"" in all type of trusses, purlins, girders, side rails, columns, runners, beams, ties, portals, framework,bracing, brackets, sagrods 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) 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).	8	MT	1 75 210	14 01 680
412	01CS.6	MISCELLANEOUS STEEL WORKS SPECIFICATIONS NO. 6-68-0008				
413	01CS.6.15	Anchor Bolts - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
414	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).	0.2	MT	1 54 670	30 934
415	01CS.6.16	MS Metal Inserts - Non FIM Items				
416	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).	0.2	MT	1 43 900	28 780
417	01CS.6.17	GI Pipe Sleeves - Non FIM Items				
418	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.	0.15	MT	1 78 600	26 790
419	01CS.6.18	MS Chequered Plates - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
420	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).	1	MT	1 50 200	1 50 200
421	01CS.6.19	MS Grating Cat. A,B - Non FIM Items				
422	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.	0.25	MT	1 34 520	33 630
423	01CS.6.20	Cold Formed Light guage - Non FIM Items				
424	01CS.6.20.1	Supplying, fabricating, erecting in position at all levels and locations and testing COLD FORMED LIGHT GAUGE STEEL structural sections of any approved shape for purlins, side girts etc. (manufactured by approved manufacturer) including sag rods, cleats, crook bolts, fixtures, splices/sleeves, bolts, nuts, cutting to required size straightening if required, bolting/ welding of joints, finishing edges by grinding, fixing in line and level with temporary staging and removal of the same after final alignment, preparation and submission of detailed fabrication drawings, preparing the surface for painting and applying shop primer as per EIL Specification No. 6-44-0004 (or Job Specification, wherever applicable) etc. all complete as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	13	MT	1 75 210	22 77 730
425	01CS.6.22	MS Rungs - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
426	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).	30	kg	110	3 300
427	01CS.6.23	Hand Railing 1000mm - Non FIM Items				
428	01CS.6.23.3	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 (80-85 micron as per IS:4759, IS:2629, IS: 4736, IS:2633), shop primer (1 coat of P6 of 40 micron) as per Sl. No. 8.1 of Table 8.0 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).	50	m	1 950	97 500
429	01CS.6.25	Mechanical Anchor fastners - Non FIM Items				
430	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. "	4	each	850	3 400
431	01CS.6.26	Chemical Anchor Fastner				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
432	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. "	4	each	2 720	10 880
433	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. "	1	each	3 390	3 390
434	01CS.6.31	Scaffolding System				
435	01CS.6.31.1	Providing and fixing double scaffolding system (cup lock type) on the exterior side, up to & inclusive of 20 m height, made with 40 mm dia M.S. tube 1.5 m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staircase system in the scaffolding for working platform 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. complete as per directions and approval of Engineer-in-charge .The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding.	80	m^2	320	25 600
436	01CS.10	DEMOLISHING AND DISMANTLING (REFER SPEC NO. 6-68-0012)				
437	01CS.10.1	Brickwork - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
438	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).	2	m^3	2 950	5 900
439	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.	2	m^3	3 190	6 380
440	01CS.10.2	RCC - Non FIM Items				
441	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	3 680	7 360
442	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.	2	m^3	3 970	7 940
443	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).	0.5	m^3	15 000	7 500
444	01CS.10.6	Steelwork - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
445	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.	1	MT	19 290	19 290
446	01CS.11	MISCELLANEOUS ITEMS (REFER SPECIFICATION NO. 6-68-0013)				
447	01CS.11.1	Antitermite - Non FIM Items				
448	01CS.11.1.1	Providing and injecting approved chemical emulsions as specified for pre-constructional ANTI-TERMITE TREATMENT and creating a chemical barrier under and around column pits, wall trenches, basement excavations, top surfaces of plinth filling, junction of wall and floor, along the external perimeter of building, expansion joints, surrounding of pipes and conduits etc. all complete as specified and directed. (Plinth area of the building at ground floor only shall be measured).	180	m^2	480	86 400
449	01CS.11.3	Cutting RCC Piles - Non FIM Items				
450	01CS.11.3.1	Cutting the heads of R.C.C. piles of diameter upto 600mm and a length not exceeding 1500mm including exposing/ cleaning, bending of the reinforcement, making site clean for casting of pile cap and removal of debris to the spoil heaps within the plant boundary etc. all complete as specified & directed. (Excavation; if any, to be measured separately under respective item).	100	each	4 070	4 07 000
451	01CS.11.3.3	Cutting the heads of R.C.C. piles of diameter upto 600mm and a length more than 1500 mm but not exceeding 3000mm including exposing/ cleaning, bending of the reinforcement, making site clean for casting of pile cap and removal of debris to the spoil heaps within the plant boundary etc. all complete as specified & directed. (Excavation; if any, to be measured separately under respective item).	26	each	3 210	83 460
452	01CS.11.4	Building pile heads - Non FIM Items				
453	01CS.11.4.5	Providing and building up pile heads of diameter upto 600mm in RCC of grade M30 with 20mm and down size graded crushed stone aggregates/ gravel including all shuttering but excluding the cost of reinforcement (to be measured under respective item) all complete as directed.	1	m^3	13 780	13 780
454	01CS.11.6	Sand Filling - Non FIM Items				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
455	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 .	400	m^3	2 350	9 40 000
456	01CS.11.7	DPC - Non FIM Items				
457	01CS.11.7.2	Providing and laying 40mm thick DAMP PROOF COURSE with plain cement concrete of grade M20 (nominal mix) with 10mm and down size graded crushed stone aggregates and mixing integral water proofing compound (conforming to IS 2645) as per manufacturer's specifications, applying two coats of hot Bitumen (Grade VG10 conforming to IS 73) @ 1.7 kg/sq.m for each coat, on top surface as per specifications including cleaning, watering the top surface of walls, centering, shuttering, placing, tamping, curing, sprinkling an even layer of dry and sharp sand over the hot bitumen etc. all completed as specified and directed.	10	m^2	760	7 600
458	01CS.11.10	BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE				
459	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.	4000	kg	210	8 40 000
460	01CS.14	BONDING FRESH CONCRETE TO OLD CONCRETE BY EPOXY RESIN BONDING SYSTEM (REFER SPECIFICATION NO. 6-68-0056)				
461	01CS.14.1	Epoxy Resin - non FIM Items				
462	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).	1	kg	1 320	1 320

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
463	01CS.19	CONCRETE BLOCK MASONRY (REFER SPECIFICATION NO. 6-68-0016)				
464	01CS.19.2	Solid Conc Block (Half) Grade C (5.0) - Non FIM Item				
465	01CS.19.2.1	Providing and laying HALF CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0) in cement mortar 1:4 (1 Cement : 4 Coarse Sand) in any shape, including the cost of materials, labour, scaffolding/ staging, sampling and testing, soaking of blocks, cutting and laying of blocks, providing openings of any shape & size, raking out the joints, supplying and placing 2 Nos. 6 mm dia. mild steel reinforcement 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.	25	m^2	1 166	29 150
466	01CS.19.3	Solid Conc Block Grade C (5.0) - Non FIM Item				
467	01CS.19.3.1	Providing and laying CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0), in cement mortar 1:6 (1 Cement : 6 Coarse Sand) in one or more block thickness and in any shape (excluding circular/ curved block masonry) at all depths below & upto plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of blocks, cutting and laying of blocks, 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, filling the blocks with mortar at specified locations, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR	50	m^3	9 220	4 61 000
468	01CS.19.3.2	Providing and laying CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0), in cement mortar 1:6 (1 Cement : 6 Coarse Sand) in one or more block thickness and in any shape (excluding circular/ curved block masonry) at all heights above plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of blocks, cutting and laying of blocks, 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, filling the blocks with mortar at specified locations, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR	300	m^3	9 700	29 10 000
469	01GC	GENERAL CIVIL				
470	01GC.13	Supply and installation of valves				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
471	01GC.13.1	Supply and installation of screwed valves as per piping material specification including fixing in position with threaded connections complete as per drawings, specifications and directions of Engineer-in-charge.				
472	01GC.13.1.3	Globe valve for following nominal sizes and piping material class				
473	01GC.13.1.3.1V2	Dia 1 Inch Piping Material Class J2A	12	each	5 200	62 400
474	01GC.15	MISC. CIVIL AND STRUCTURAL WORKS FOR U/G PIPING AND OTHER CIVIL WORKS				
475	01GC.15.ME01	Providing 20mm 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. All materials including cement supplied by the contractor.	30	sqm	640	19 200
476	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.				
477	01GC.15.2.2	All materials including cement supplied by the Contractor.	100	m²	470	47 000
478	01GC.15.3	Providing 16mm 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, inspection chambers, septic tanks,Compound wall, 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.				
479	01GC.15.3.2	All materials including cement supplied by the Contractor.	30	m²	540	16 200
480	01GC.15.6	Supplying and fixing in position medium/ heavy duty CI manhole frame with lugs and cover conforming to IS-1726 including breaking of brick masonry or concrete surface to receive frame with lugs and making good the same with CM 1:3 including applying two coats of anticorrosive paint inclusive of all labours and materials etc. complete				
481	01GC.15.6.1	circular size 500 mm dia. Medium duty of grade MD-10	5	each	9 520	47 600
482	01GC.15.6.2	circular size 560 mm dia. Heavy duty of grade HD-20	5	each	15 210	76 050
483	01GC.15.8	Providing cement mortar grouting on brick masonry / RCC wall for filling free space between pipe body and masonry wall/concrete wall with 1:2 (1 cement: 2 sand) mortar including packing, consolidating, curing, finishing, etc. complete as per drawings specifications and directions of Engineer-in-Charge.				
484	01GC.15.8.2	All materials including cement supplied by the Contractor.	5	m³	13 910	69 550

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
485	01GC.15.13	Supplying, construction , testing & commissioning of RCC Neutralisation pit concrete , providing lean concrete 1:5:10 (1 cement : 5 sand : 10 aggregate) at bottom of Neutralisation pit and PCC 1:2:4 at Finished Grade Level, rungs, lime fill, acid proof lining, chequered plate with lifting hooks, grouting in 1:2 cement mortar(1 cement :2 sand), painting with bitumen primer and Epoxy paint, grouting between pipe and pit wall in 1:2 cement mortar (1 cement : 2 sand), reinforcement steel including straightening, cleaning, cutting, bending, keeping in proper position, centering, shuttering etc. including earth work in excavation in all types of soil except soft rock and hard rock, backfilling & disposal of surplus earth for all leads within the complex limit etc. complete as per standards, drawings, specifications and directions of Engineer-in-charge.				
486	01GC.15.13.2	All material including cement supplied by the Contractor For following grade of concrete.				
487	01GC.15.13.2.1V2	grade of concrete M30	3	each	2 18 600	6 55 800
488	01GC.15.15	Providing 13mm thick average cement plaster in cement mortar 1:6 (1 cement: 6 sand) on brick walls/stone masonry/pitching or on concrete surfaces for manholes, valves pits, culverts, 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. All materials including cement supplied by the Contractor.	50	m²	450	22 500
489	01GC.22	PLUMBING AND BUILDING DRAINAGE				
490	01GC.22.ME02	Providing and fixing approved stone ware 100mmx100mm dia. gully trap as per EIL Std. no.7-65-0214 including grating with CI frame and cover 400mmx400mm including solid concrete block masonry chamber in 1:4 cement mortar(1 cement: 4 sand) on M-20 grade cement concrete foundation, plastered inside and outside surfaces with 1:3 cement mortar (1 cement: 3 sand) with 13mm average thickness including providing and fixing light duty CI frame and cover, painting CI frame and cover with two coats of chlorinated rubber zinc phosphate primer @ 40µ DFT per coat and finish painting consists of two coats of chlorinated rubber paint @40µ DFT per coat, earth work in excavation, backfilling, removal of surplus earth, benching with M-20 grade cement concrete and rendering smooth with a neat coat of cement slurry etc. all complete as per drawings, specifications and directions of Engineer-in-Charge. All materials including cement supplied by contractor.				
491	01GC.22.ME02.01	Gully trap	12	each	4 600	55 200

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
492	01GC.22.12	Supplying, laying and jointing of above ground approved quality UPVC pipes to be used for soil and waste discharge application inside buildings confirming to IS:13592 (Type-B) and fittings confirming to IS: 14735 with all necessary specials such as bends, Y junction, T junction (both single and double) plugs, coupler, adapter, shoes etc. including solvent welded jointing and testing as per IS: 7634 (Part-3), cutting floors/walls and making good the same after fixing including supply and fixing hooks/ clamps etc. complete as per drawings, specifications and directions of Engineer-in-Charge. For the following Nominal Bore (NB) pipe:				
493	01GC.22.12.1	(All materials including cement supplied by contractor)				
494	01GC.22.12.1.1V2	Nominal Dia. 75 mm	70	m	430	30 100
495	01GC.22.12.1.1V3	Nominal Dia. 90 mm	70	m	480	33 600
496	01GC.22.12.1.1V4	Nominal Dia. 110 mm	130	m	570	74 100
497	01GC.22.13	Supplying, laying and jointing of underground approved quality UPVC pipes to be used for soil and waste discharge application inside buildings confirming to IS:13592 (Type-B) and fittings confirming to IS: 14735 with all necessary specials such as bends, Y junction, T junction (both single and double), plugs, coupler, adapter etc. including solvent welded jointing and testing as per IS: 7634 (Part-3), cutting in floors, earth work in excavation, encasing the pipe in 50mm thick PCC M20, backfilling and disposal of surplus earth / debris to demarcated area anywhere within plant complex limit etc. complete as per drawings, specifications and directions of Engineer-in-Complete. For the following Nominal Bore (NB) pipe:				
498	01GC.22.13.1	(All materials including cement supplied by contractor)				
499	01GC.22.13.1.1V1	Nominal Dia. 75 mm	70	m	530	37 100
500	01GC.22.13.1.1V2	Nominal Dia. 90 mm	70	m	650	45 500
501	01GC.22.13.1.1V4	Nominal Dia. 110 mm	130	m	830	1 07 900
502	01GC.22.19	Supply and installation on terrace/ staging, circular drinking water tank, of polyethylene with PUF insulation for temperature control, material conforming to BIS codes including supply and installation of all fittings, cover with suitable locking arrangement, float valve, making necessary holes for inlet, outlet and overflow connection and vent pipe etc. and the base supports for tank including supply of all necessary material all complete as per specifications and directions of Engineer-in-charge. For following capacities				
503	01GC.22.19.1V1	Capacity 1000 Litre	8	each	12 600	1 00 800

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
504	01GC.22.20	Supplying and fixing approved quality UPVC Floor Trap with CP pressed steel grating as per IS: 14735 including cutting floors and making good the same, etc., making inlet and outlet connections, etc. complete for 100mm inlet and 75mm outlet as per drawings, specifications and directions of Engineer-in-Charge.	13	each	340	4 420
505	01GC.22.21	Supplying and fixing approved quality UPVC Floor Trap with CP pressed steel grating as per IS: 14735 including cutting floors and making good the same, etc., making inlet and outlet connections, etc. complete for 100mm inlet and 90mm outlet as per drawings, specifications and directions of Engineer-in-Charge.	13	each	410	5 330
506	01GC.22.22	Construction, supplying, installation, testing and commissioning of septic tank as per standards and IS:2470 Part-I , with all necessary accessories like inlet, outlet pipes, vent pipes, manhole covers, rungs etc. including earthwork in excavation in all type of soil except soft and hard rock, backfilling and disposal of surplus earth for all leads etc. complete as per standards, drawings, specifications and directions of Engineer-in-Charge.				
507	01GC.22.22.01V1	All materials including cement supplies by the contractor No. of Users 10 nos	1	each	2 21 000	2 21 000
508	01GC.22.22.01V4	All materials including cement supplies by the contractor No. of Users 50 nos	1	each	4 72 000	4 72 000
509	01GC.22.23	Preparation of internal building plumbing and sanitary piping layouts for building as per National Building Code/ Relevant IS codes and getting the same approved by Owner/ PMC.				
510	01GC.22.23.1V90	Building Name SRR-11	1	each	44 000	44 000
511	01GC.22.23.1V91	Building Name Substation-JP1	1	each	44 000	44 000
512	01GC.22.23.1V92	Building Name Gate House	1	each	44 000	44 000
513	01GC.22.23.1V93	Building Name Substation JU1 & SRR-12	1	each	44 000	44 000
514	01GC.25	ACID RESISTING BRICK/ TILE LINING				
515	01GC.25.2	Supply and laying of unglazed vitreous acid resisting tiles confirming to IS: 4457, applying silicate/ resin mortar for jointing as per IS: 4832 (Part I/ II) including applying bitumen primer and 19mm thick bitumen mastic on cement plaster surfaces/ masonry/ RCC surface. The thickness of the tiles shall be minimum 16mm. The size of the tile shall be 300mm x 300mm. Including supply of all materials, finishing, curing, testing etc. as per drawings , specifications and directions of Engineer-in-charge.	70	m²	3 800	2 66 000
516	01GC.26	MISCELLANEOUS ITEMS				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
517	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.	1	each	46 300	46 300
518	01GC.28	NDT Testing				
519	01GC.28.1	DYE PENETRATION / MAGNETIC PARTICLE TEST Performing of magnetic particle test or dye penetration test including supply of all necessary materials, equipment and labour for carrying out the work as per specs. and direction of Engineer-in -charge				
520	01GC.28.1.1	DP TEST LENGTH(BW&SW)	10	Inch	70	700
521	01GC.28.1.2	MAGNETIC PARTICLE TEST	10	Inch	110	1 100
522	01GC.28.3	RADIOGRAPHY :- 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. 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'.				
523	01GC.28.3.1	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF SPEC FOR NDT REQUIREMENT OF PIPING)				
524	01GC.28.3.1.1V2	Nominal Dia. 4 Inch	4	nos	2 840	11 360
525	01GC.28.3.1.1V3	Nominal Dia. 6 Inch	4	nos	4 260	17 040
526	01GC.28.3.1.1V6	Nominal Dia. 2 Inch	4	nos	1 420	5 680
527	01GC.28.3.1.1V7	Nominal Dia. 1 Inch	4	nos	970	3 880
528	01GC.30	Installation of Valve				
529	01GC.30.1	Transportation of all kind of valves(including special and motor operated valves) from owner's storage point to contractor's store/ work site and installation of valves for all rating including assembly of valve accessories, if any, fixing of gaskets, bolts/ nuts etc. complete as per specifications drawings and direction of Engineer-in-charge including returning all unused/ surplus material to owner's storage point (valves along with accessories shall be supplied by owner as free issue material)				
530	01GC.30.1.1	Flanged/ Wafer Valves				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
531	01GC.30.1.1.1V1	Nominal Dia. 6 Inch	4	nos	2 700	10 800
532	01GC.30.1.1.1V4	Nominal Dia. 1 Inch	4	nos	450	1 800
533	01GC.30.1.1.1V5	Nominal Dia. 4 Inch	8	nos	1 800	14 400
534	01GC.30.1.1.1V10	Nominal Dia. 2 Inch	3	nos	900	2 700
535	01GC.30.1.1.1V17	Nominal Dia. 1.5 Inch	2	nos	900	1 800
536	01GC.34	Rain Water Recharging Well				
537	01GC.34.1	Construction of rain water recharging well including earthwork in excavation in all types of soils excluding soft rock and hard rock, excavation in soft rock and hard rock shall be paid under relevant item, backfilling and disposal of the debris/surplus earth within a lead of 100 m, supply of all filler materials, mild steel perforated pipe, precast cover slab, brick masonry etc all complete as per EIL standard drawings, specifications and directions of Engineer-in-charge. (Depth of well upto 10.0m from ground level) For catchment area:				
538	01GC.34.1.1	Up to 500 Sqm	1	each	2 00 000	2 00 000
539	01GC.34.1.2	Above 500 sqm and up to 1500sqm	2	each	2 87 270	5 74 540
540	01GC.34.1.3	Above 1500 sqm and up to 3000sqm	1	each	4 38 890	4 38 890
541	01GC.36	Portable/ trolley mounted Extinguishers				
542	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.				
543	01GC.36.1.1V2	Capacity in Kg 6	80	nos	2 920	2 33 600
544	01GC.36.5	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.				
545	01GC.36.5.1V2	Capacity in Kg 4.5	80	nos	5 390	4 31 200
546	01GC.38	Painting of A/G pipes and valves				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
547	01GC.38.1	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 painting specification, drawings and direction of Engineer-in-Charge for all types of un insulated 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. 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 hydro testing. 2. No extra payment shall be made for identification (line numbering etc.) of insulated and uninsulated lines.				
548	01GC.38.1.1	Painting of uninsulated surfaces for ' Industrial marine ' environment as per painting specification for CS piping for design temp group: -14 to 80 (Deg C) including surface preparation. For following pipe sizes				
549	01GC.38.1.1.1V1	Nominal Dia. 1 Inch	20	m	70	1 400
550	01GC.38.1.1.1V3	Nominal Dia. 4 Inch	20	m	279	5 580
551	01GC.38.1.1.1V5	Nominal Dia. 6 Inch	110	m	418	45 980
552	01GC.38.1.1.1V10	Nominal Dia. 2 Inch	10	m	139	1 390
553	01GC.38.1.1.1V20	Nominal Dia. 1.5 Inch	10	m	104	1 040
554	01GC.38.1.2	Painting of uninsulated surfaces for ' Industrial marine ' environment as per painting specification for CS piping for design temp group: -14 to 80 (Deg C) including surface preparation. For following valve sizes				
555	01GC.38.1.2.1V1	Dia. Of Valve 1 Inch	8	each	105	840
556	01GC.38.1.2.1V3	Dia. Of Valve 4 Inch	8	each	418	3 344
557	01GC.38.1.2.1V4	Dia. Of Valve 6 Inch	3	each	627	1 881
558	01GC.38.1.2.1V9	Dia. Of Valve 2 Inch	8	each	209	1 672
559	01GC.41	Supply, fabrication and Erection of piping(underground)				
560	01GC.41.6	Water System Galvanised Pressure Piping (Under Ground) (Screwed)				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
561	01GC.41.6.1	Supplying and laying carbon steel galvanised pipes as per piping materials specification Class underground including supply of all necessory fittings including Tee, reducing Tee, reducing Coupling, nipple, coupling, elbows etc. supply of teflon tapes, PTFE tape, white lead, etc. cutting the pipes to required lengths, making threads, earthwork in excavation for trenches, etc. in all types of soil except soft rock & hard rock including dewatering, shoring and strutting if required, dressing of sides, levelling, grading and ramming of bottoms, including laying of pipes in trenches, jointing the pipes and fittings with threaded connections, hydrostatic testing of the piping, backfilling the trenches with selected/approved earth fill material, cutting of roads wherever required, making good the road surface after laying, disposal of surplus earth at a designated area anywhere within complex limit etc., complete as per specifications, drawings and directions of Engineer-in-Charge. For following Nominal Size and Piping Material Class.				
562	01GC.41.6.1.1V1	Nominal Dia 1 Inch Piping class J2A	90	m	1 500	1 35 000
563	01GC.41.6.1.1V5	Nominal Dia 2 Inch Piping class J2A	70	m	3 110	2 17 700
564	01GC.41.10	UNDERGROUND SEWER SYSTEM - RCC PIPES				
565	01GC.41.10.1	Supplying and laying underground R.C.C. pipes sewers with socket and spigot ends conforming to IS:458 of approved make, to proper grade and alignment, including earthwork in excavation in all types of soil except soft and hard rock for pipe trenches upto 2.0m depth of excavation, etc. including dewatering, shoring and shuttering if necessary, dressing of sides, leveling, grading and ramming of bottoms, cutting the R.C.C. pipes to required lengths, lowering the pipes, jointing, including connecting the pipes to manholes and grouting the pipe body with manhole wall using cement mortar 1:2 (1 cement : 2 sand), testing, draining of water and cleaning of pipe after testing, 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 15cm compacted thickness , watering and compacting with mechanical means like vibro rammers etc. to 90% standard proctor density as per IS:2720 Part-VII, making good the surface, including cutting of roads wherever required and making good the same, disposal of surplus earth/ unserviceable material to demarcated area anywhere within the complex limit etc. complete for all depths as per drawings, specifications and instructions of Engineer-in-Charge.(All material shall be supplied by contractor) For following Pipe size (mm) and Class (pipe sizes are all internal diameter of the pipes)				
566	01GC.41.10.1.1V1	Dia. (Internal) 150 mm Pipe Class P1	130	m	1 000	1 30 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
567	01GC.42	Fabrication and Erection of piping (Above ground)				
568	01GC.42.1	PIPING (ABOVE GROUND): Transportation of all piping items from owner's storage point to work site/workshop, fabrication including cutting, edge preparation (including grinding the edges of pipe, 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 of all type and thickness over pipe sleepers, overhead on racks and at all elevations, connecting with equipment nozzles, strainers, orifice assemblies, tapping for pressure gauges etc., fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fitting like elbows, reducers, tees, vents, drains, SW valves upto 1.5 NB, alignment, cleaning & flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified, draining, drying by compressed air completing all such works in all respects (including preparation of isometrics as mentioned in the scope of work for the job) as per drawings, specifications and instruction of Engineer-in-charge. (Pipes and fittings shall be supplied by owner as free issue material)				
569	01GC.42.1.1	Carbon Steel Piping (Non IBR), Thickness <=10 mm				
570	01GC.42.1.1.1	Fabrication, For the following nominal sizes				
571	01GC.42.1.1.1.1	NB upto 1.5 inch	40	Inch Dia	740	29 600
572	01GC.42.1.1.1.2	NB 2 inch - 6 inch	40	Inch Dia	740	29 600
573	01GC.42.1.1.2	Erection , for Water System (Pressure Piping), For following Nominal Sizes				
574	01GC.42.1.1.2.1	NB upto 1.5 inch	30	Inch Mtr	260	7 800
575	01GC.42.1.1.2.2	NB 2 inch - 6 inch	30	Inch Mtr	260	7 800

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
576	01GC.42.1.ME03	PIPING (ABOVE GROUND): Transportation of all piping items from owner's storage point to work site/workshop, including providing internal cement lining on pipes and specials as per specification for cement lining, fabrication including cutting, edge preparation (including grinding the edges of pipe, fittings, flanges etc. to match with the mating edges of uneven/different thickness wherever required), fitup, bending, preheating wherever required, welding, including providing pipe joints as per specifications including supply & erection of collars for pipe joints and laying of pipes of all type and thickness over pipe sleepers, overhead on racks and at all elevations, connecting with equipment nozzles, strainers, orifice assemblies, tapping for pressure gauges etc., fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fitting like elbows, reducers, tees, vents, drains, SW valves upto 1.5 NB, alignment, cleaning & flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified, draining, drying by compressed air completing all such works in all respects (including preparation of isometrics as mentioned in the scope of work for the job) as per drawings, specifications and instruction of Engineer-incharge. (Pipes and fittings shall be supplied by owner as free issue material)				
577	01GC.42.1.ME03.01	Dia. 4 Inch PMS A94Y	20	metre	1 860	37 200
578	01GC.42.1.ME03.02	Dia. 6 Inch PMS A94Y	130	metre	2 380	3 09 400
579	01GC.43	Supply, fabrication and Erection of piping (Above ground)				
580	01GC.43.2	Miscellaneous G.I. PIPING (ABOVE GROUND)				
581	01GC.43.2.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes as per piping material specification, including supply and installation 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 technological structures etc. including joining of pipes and fittings with threaded/ flanged connections etc. hydrostatic testing of the piping including supply of necessary fittings etc. and pipe supports complete as per data sheets, specifications, drawings and instructions of Engineer-in-charge.				
582	01GC.43.2.1.1V1	Dia. 2 Inch PMS J2A	70	m	1 550	1 08 500
583	01GC.43.2.1.1V2	Dia. 1 Inch PMS J2A	70	m	760	53 200
584	01GC.51	fire fighting equipment's				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
585	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.				
586	01GC.51.5.3	Double headed landing valve	9	each	25 620	2 30 580
587	01GC.51.5.5	First Aid hose reel wall mounted type	9	each	9 260	83 340
588	01GC.51.5.8	Hose box cabinet Type-II (Wall mounted type) including all inside accessories, including all civil works, fixing in position with anchor bolts in foundations or wall	9	each	30 000	2 70 000
589	01GC.99	Miscellaneous Items				
590	01GC.99.01	Miscellaneous				
591	01GC.99.01.ME01	Supply and installation of an Air release valve in the piping network, as per the datasheet B895-999-81-45-DS-8021 attached to the tender, as per the standards, specifications, and directions of the Engineer in Charge.	3	each	1 690	5 070
592	01GC.99.01.ME03	Supply and installation of portable Clean Agent Type extinguisher (MS body) with HFC or Fluro ketone having BIS marking as per IS 15683 having a minimum fire rating of 2A, 21B 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. 4kg capacity	1	each	27 080	27 080
593	01GC.99.01.ME04	Supply and installation of portable Clean Agent Type extinguisher (MS body) with HFC or Fluro ketone having BIS marking as per IS 15683 having a minimum fire rating of 2A, 21B 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. 2 kg Capacity	3	each	13 950	41 850
594	11CS	CIVIL, STRUCTURE AND ARCHITECTURE				
595	11CS.18	WATER SUPPLY				
596	11CS.18.7	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. Internal Work - Exposed on wall:				
597	11CS.18.7.3	25 mm nominal dia Pipes	130	metre	446	57 980

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
598	11CS.18.8	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc.				
599	11CS.18.8.1	15 mm nominal dia Pipes	80	metre	542	43 360
600	11CS.18.8.2	20 mm nominal dia Pipes	130	metre	575	74 750
601	11CS.18.8.3	25 mm nominal dia Pipes	130	metre	649	84 370
602	11CS.18.9	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External Works:				
603	11CS.18.9.1	15 mm nominal dia Pipes	70	metre	293	20 510
604	11CS.18.9.2	20 mm nominal dia Pipes	70	metre	317	22 190
605	11CS.18.9.3	25 mm nominal dia Pipes	130	metre	391	50 830
606	01AR	ARCHITECTURE				
607	01AR.2	FLOOR FINISHING				
608	01AR.2.1	Providing and laying average 25mm cement concrete flooring in panels consisting of base course of 1:2:4 grade cement concrete (6mm down size stone aggregate) laid over sub-base of cement concrete and finishing with a layer of floating coat of neat cement slurry @ 2.75kg. of cement per Sq. M. of area including cleaning the sub-base surface, applying neat cement slurry @ 2.75 kg of cement per Sq. M. of area over the sub- base to receive the base course, compacting, tamping, trowelling, finishing, curing, providing, shuttering to the edges etc. all complete. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST .				
609	01AR.2.1.2	25mm thk. cement concrete flooring. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST .	1300	m²	510	6 63 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
610	01AR.2.2	Providing and laying cement concrete granolithic flooring in panels consisting of base course (under layer of 1:2:4 grade cement concrete, 6mm down size stone aggregates) laid over sub-base, wearing top- layer of cement mortar (1 cement: 3 coarse sand by volume) finished smooth by tamping, trowelling, and with a finishing floating coat of neat cement slurry @ 2.75kg. of cement per Sq. M. of area including cleaning the sub-base surface, applying neat cement slurry over the sub- base @ 2.75Kg of cement per Sq. M of area to receive the base course, compacting, tamping, trowelling, finishing, curing, providing, shuttering to the edges etc. all complete.				
611	01AR.2.2.1	With average 25mm thick under-layer and 15mm thick top layer. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	30	m²	1 210	36 300
612	01AR.2.3	50mm thick heavy duty flooring				
613	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.	2500	m²	1 310	32 75 000
614	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.				
615	01AR.2.4.1	18mm thick. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	250	RM	103	25 750
616	01AR.2.4.3	12mm thick. CEMENT SUPPLIED BY THE CONTACTOR AT THEIR COST.	30	RM	73	2 190
617	01AR.2.6	Panel dividers in flooring/dado				
618	01AR.2.6.4	P.V.C. panel dividers (3mm x 20mm size.)	800	RM	83	66 400
619	01AR.2.6.5	P.V.C. panel dividers (3mm x 35mm size.)	80	RM	88	7 040

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
620	01AR.2.10	Providing and laying machine cut chissel dressed kota stone slab of approved shade in floor tread, landing, riser, skirting, dado over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 Kg of cement per Sq.M of area to receive the mortar, providing neat cement slurry @ 4.4kg. of cement /Sq.M of area over the mortar bed, jointing each slab with neat cement paste/ grouting white cement and pigment (conforming to IS : 2114, Table-1, matching the shade of slabs), machine cutting of the slab edges square, true & plumb finishing, grinding, polishing, finishing etc. all complete.				
621	01AR.2.10.1	25mm thick kota stone slab (with tolerance +_2mm for thickness, +_2mm for length/ breadth) in floor, landing tread over average 15mm thick cement mortar 1:4(1 Cement : 4 coarse sand by volume). CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	80	m²	1 310	1 04 800
622	01AR.2.10.3	18mm thick kota stone slab in riser, dado, skirting over average12mm thick cement mortar1:3(1 cement:3 coarse sand by volume). CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	80	m²	1 690	1 35 200
623	01AR.2.10.5	Extra for providing round nosing by machine cutting of the slab.	10	RM	549	5 490
624	01AR.2.11	Providing and laying tiles in flooring , dado, skirting etc. in approved colour, design and pattern, laid over and including a coating of approved adhesive as per manufacturers specifications, flush pointing of joints of tiles with cement paste/ grouting with white cement and pigment (conforming to IS:2114, Table-1, matching the shade of tiles) finishing, cleaning etc. all complete.				
625	01AR.2.11.5	Ceramic, matt finished non-slip type tiles of approved make and shade(s) in approved design/ pattern including cleaning the finished surface with oxalic acid, wax polishing etc. for size 300mm x 300mm x 8mm (+5%) thick tiles for flooring.	80	m²	1 610	1 28 800
626	01AR.2.11.6	Ceramic, matt/ glazed/ semi-glazed finished tiles of approved make & shade(s) in approved design/ pattern including cleaning the finished surface with oxalic acid, wax polishing etc. for size 300mm x 450mm x 8.5mm thick (minimum) tiles	80	m²	1 760	1 40 800
627	01AR.2.15	Providing and applying pigmented (approved shade) chemical and abrasion resistant, solvent based self levelling floor coating based on epoxy resin with amine curing agents, in 2 coats @ 125 gms/sq.m. (min.)per coat by brush or spraying over a levelling screed (min. 3mm thick) of a 3 part solvent free combination of epoxy resin, amine hardeners and graded chemically inert aggregate filler, laid over a coat of 2-part epoxy resin primer applied over existing flooring etc. all as per manufacturer's specifications.	600	m²	2 070	12 42 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
628	01AR.2.16	Providing and applying pigmented (approved shade) chemical and abrasion resistant, solvent based coating (on dado/wall) of epoxy resin with amine curing agents, in 2 coats @ 125 gms/sq.m. (min.) per coat by brush over plastering/ concrete surfaces including surface preparation, curing etc. all as per manufacturer's specification.	200	m²	428	85 600
629	01AR.2.17	Providing and laying minimum 18mm thick approved premium quality and shade polished granite stone slabs in flooring, counters, treads, risers, skirting, dado etc. over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement maixed with pigment (conforming to IS:2114, Table-1) to match the colour of the granite stone slabs, finishing etc. all complete.				
630	01AR.2.17.1	Granite stone slabs in flooring, counters, treads etc.(perfectly levelled) over and including a bed of cement mortar 1:4 (1 cement: 4 coarse sand by volume) CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST	150	m²	5 240	7 86 000
631	01AR.2.17.3	Granite stone slabs in risers, skirting, dado etc. over and including a bed of cement mortar 1:3 (1 cement: 3 coarse sand by volume) CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	80	m²	5 950	4 76 000
632	01AR.2.17.5	Extra for round nosing/ moulded edges (as per approved design) to Granite stone slabs.	130	RM	630	81 900
633	01AR.2.21	Providing and laying anti slip (rough)Granite stone slabs, of thickness minimum 25mm, in flooring, landing, tread, ramps over minimum 20mm thick cement mortor1:4 (1 cement :4 course sand by volume) over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement mixed with pigment (conforming to IS:2114, Table-1) to match the colour of the granite stone slabs, finishing etc. all complete.				
634	01AR.2.21.01	Cement supplied by the Contractor at there cost	70	m²	6 160	4 31 200
635	01AR.2.22	Providing and fixing approved design and shade heavy duty 10mm thick 300mm x 300mm Exterior grade vitrified tiles (of ¿pavgres¿ series of ¿Kajaria¿ or approved equivalent) over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement mixed with pigment (conforming to IS:2114, Table-1)				
636	01AR.2.22.1	Cement supplied by the Contractor at there cost	10	m²	1 052	10 520
637	01AR.2.23	Providing 3 nos. of 3mm grooves at spacing of 30mm in Kota/ Marble/ granite stone laid in stairs¿ treads/ landings all complete as per the direction of Engineer-In-Charge. (Single measurement shall be considered for 3 parallel grooves)	450	RM	250	1 12 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
638	01AR.3	WOOD WORK				
639	01AR.3.1	Wooden frames of doors, windows, ventilators Providing and fixing wooden frames of doors, windows, ventilators including cutting, shaping, jointing, applying a coat of bituminous paint on concealed surface, wood primer on exposed surface, fixing in masonry/RCC by means of 300mm x 25mm x 6mm thick M.S. hold fasts screwed to frame @ 600mm max vertically and grouted with M-15 grade concrete in min. 350mm x 100mm x 100mm sized hole made in masonry/96mm long, 12mm dia M.S. dash fastener, painting with two coats of approved shade and make (ICI or equivalent) synthetic enamel paint over approved quality primer coat, finishing etc. all complete.				
640	01AR.3.1.1	Wooden frames with second class teak wood conforming to IS : 4021.	0.2	m³	1 38 800	27 760
641	01AR.3.2	35mm thick block board flush shutter Providing and fixing Factory made, overall 35mm thick block board flush shutter consisting of solid core block board bonded with phenol phormaldehyde synthetic resin conforming to IS : 848 and faced on both faces with commercial type plywood/teakwood veneering/ lamination bonded with phenol formaldehyde synthetic resin conforming to IS : 848, including providing and fixing second class teakwood perimeter beading fixed by means of approved quality neoprene based adhesive and nailing @ 300 mm max.. painting exposed surface with two coats of approved shade and make synthetic enamel paint over approved quality primer coat, providing and fixing 125mm long M.S. butt hinges [for each shutter (vertical spacing not exceeding 600mm)] including fixing with door frame, finishing etc. all conforming to IS : 2202.				
642	01AR.3.2.3	Door shutter faced with 1mm thick approved quality lamination of approved shade/brand.	6	m²	5 310	31 860
643	01AR.3.7	Providing and fixing in position following items including all necessary fixtures, fittings, finishing etc. all complete.				
644	01AR.3.7.1	Approved make heavy duty overhead hydraulic door closer with adjustable spanners, metal screws etc. conforming to IS : 3564	35	nos	1 793	62 755
645	01AR.3.7.4	Approved make heavy duty hydraulically operated, adjustable floor mounted door closer conforming to IS:6315, Double action type.	15	nos	7 912	1 18 680
646	01AR.3.7.6	Approved make pressure die cast zinc alloy, chromium plated door handle. 300 mm long.	25	nos	529	13 225
647	01AR.3.7.7	Approved make pressure die cast zinc alloy, chromium plated door handle. 600mm long.	10	nos	959	9 590
648	01AR.3.7.8	Approved quality 3mm thick plastic kick/push plate fixed with brass screws.	8	m²	1 590	12 720
649	01AR.3.7.9	Approved quality anodized aluminium aldrop 300mm long, 19.05mm dia in bronze colour.	18	nos	410	7 380
650	01AR.3.7.10	Approved quality anodized aluminium tower bolts conforming to IS-204 in Bronze colour, 250 x 10mm.	10	nos	150	1 500

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651	01AR.3.7.11	Approved quality anodized aluminium tower bolts conforming to IS-204 in Bronze colour, 150 x 10mm.	25	nos	54	1 350
652	01AR.3.7.12	Approved quality zinc alloy pressure die cast, chromium plated spring loaded round door stopper with double heavy duty rubber shoes.	20	nos	230	4 600
653	01AR.3.7.13	Approved quality 75mm long aluminium toilet door latch with vacant/occupied indicator.	8	nos	776	6 208
654	01AR.3.7.14	Approved quality chromium plated brass coat and hat hook fixed with chromium plated brass screws.	8	nos	123	984
655	01AR.3.8	Providing and fixing minimum 12mm thick X 50mm wide teak wood Architrave (moulding) of approved design along frames etc. including lacquer polishing/ painting matching with adjoining wood work.	8	m	530	4 240
656	01AR.4	STEEL/AL./GLAZED/FULLY GLASS/PVC DOORS,WINDOWS & VENTILATORS				
657	01AR.4.5	S/F M.S. rolling shutters Supplying and fixing M.S. rolling shutters, conforming to IS : 6248 including providing all accessories like shutter (constructed with inter locking lath sections formed out of cold rolled steel strips 0.9mm thick, 80mm wide and 1.25mm thick, 80mm wide respectively for shutter width upto 3.5M and above 3.5M), jointless M.S. channel section for guide (min. 3.15mm thick), M.S. girders, pressed bottom rails, shutter suspension stud shaft with pully and cage, top rolling springs, locking arrangement etc. as per approved manufacturers drawings including painting with two coats approved make & shade and synthetic enamel paint over a coat of approved quality red oxide zinc chromate primer, making good of all damaged surfaces etc. all complete.				
658	01AR.4.5.9	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width upto 3.5 metre with all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	50	m²	9 910	4 95 500
659	01AR.4.5.10	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width beyond 3.5 metre with all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	80	m²	10 230	8 18 400
660	01AR.4.5.11	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width upto 3.5 metre with MS grill (in place of interlocked lath sections), all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	8	m²	7 260	58 080
661	01AR.4.5.12	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width beyond 3.5 metre with MS grill (in place of interlocked lath sections), all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	5	m²	9 400	47 000

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662	01AR.4.9	Fully Glass Door Providing and fixing frameless single piece Glass Doors (swing shutter) in partition made of 12mm thick toughened float glass (MODIGUARD or equivalent) single shutter with stainless steel finish patch fittings (DORMA or approved equivalent)and 150mm x 44mm extruded Aluminium frame at bottom , including all hardware such as SS patch fittings, floor spring, pivot on top, locking arrangement (EVERITE or approved equivalent make), 30mm dia, 350mm long SS pull handle (DORMA or approved equivalent make) etc. all complete.	7	m²	8 860	62 020
663	01AR.4.10	Etching Film on Glass Providing & applying translucent cast vinyl self adhesive washable type film with sandblasting effect (of '3M(TM) Scotchcal(TM) Frosted Crystal 7725-324' or approved equivalent) and of approved graphic design (electronic/ computer plotted & cut) having durability of 10-15 years, over glass surface in doors/ windows/ partitions etc. including preparation of base surface, cleaning, finishing etc. all complete.	24	m²	1 470	35 280
664	01AR.4.12	Pressed steel sheet door shutter Providing and fixing pressed steel sheet door shutter made of 18 SWG galvanized pressed steel sheet bent to form hollow box of 40 mm overall thickness; and consisting of/ including: (i) 3 mm thick MS flat all along perimeter (ii) Packing the shutter with mineral wool (48 kg/cum) without gap (iii) Strengthening with 18 SWG GI vertical stiffeners @200 c/c (iv) 3 mm thick MS pad plates welded inside at required locations for fixing of hardware etc. (v) Fixing to door frame by 100 mm long SS 304 grade heavy duty ball bearing hinge @600 c/c maximum (vi) Hardware and vision panel as required. (vii) Grinding and smoothening of welding, cleaning, finishing (synthetic enamel painting/ polyurethane (PU) coating/ electrostatic powder coating), making true alignments and surfaces etc. all complete. Notes: 1. Reference shall be made to EIL standard nos. 7-75-0070, 7-75-0071 Only the net shutter(s) area shall be measured for payment				

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665	01AR.4.12.3	Single shutter painted with Electrostatic powder coating with following hardware: (i) Over head hydraulic door closer (heavy duty). (ii) SS 304 grade 16 mm dia 250mm long aldrop on both sides of shutter. (iii) Spring loaded heavy duty door stopper (iv) SS 304 grade 19 mm dia.200 mm long handle on both side of shutter. (v) 10 mm dia SS 304 tower bolt (250mm long for 2100mm height & 600mm long for 2500mm height)	13	m²	11 660	1 51 580
666	01AR.4.12.6	Double shutter painted with Electrostatic powder coating with following hardware: (i) Over head hydraulic door closer (heavy duty). (ii) SS 304 grade 16 mm dia 300mm long aldrop on both sides of shutter. (iii) Spring loaded heavy duty door stopper. (iv) SS 304 grade 19 mm dia.200 mm long handle on both side of shutter. (v) 10 mm dia SS 304 tower bolt (250mm long for 2100mm height & 600mm long for 2500mm height) (vi) 2mm thick 25mmx 25mm GI angles (vertical) welded to each shutter at the meeting point of double shutter.	45	m²	12 830	5 77 350
667	01AR.4.14	Aluminium work for doors, windows, ventilators and partition Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) :				
668	01AR.4.14.2	For fixed portion of aluminium doors, windows, ventilators and partitions made from Powder coated aluminium (minimum thickness of powder coating 50 micron)	350	kg	710	2 48 500
669	01AR.4.14.5	For shutters of doors, windows & ventilators made from Powder coated aluminium (minimum thickness of powder coating 50 micron) including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber / neoprene gasket required (Fittings shall be paid for separately)	750	kg	830	6 22 500

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670	01AR.4.14.13	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and brass cover plate of minimum thickness 1.25 mm with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge.	12	each	2 590	31 080
671	01AR.4.14.15	Providing and fixing machine moulded aluminium covering of approved pattern & design, made out of machine cut Powder coated aluminium sheet, 2.5mm thick (minimum thickness of powder coating 50 micron) and machine holed for receiving dash fastener, over expansion joints on vertical surfaces/ceiling floors, the fixing on plate in one row on one side of joint only shall be done with stainless steel dash fasteners of 8 mm dia and 75 mm long bolt including providing aluminium washers 2 mm thick & 15 mm dia , at a staggered pitch of 200mm centre to centre including drilling holes in the receiving surface and providing expandable plastic sleeves in holes etc. complete as per direction of Engineer-in-charge.	380	kg	630	2 39 400
672	01AR.4.14.16	Filling gaps of size upto 5mm depth and 5 mm width in between aluminium frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete	180	m	59	10 620
673	01AR.4.14.18	Providing and fixing 255 X 19 mm adjustable friction window stays of approved quality made from Stainless Steel (SS 304 grade) with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-charge complete.	90	each	330	29 700
674	01AR.4.14.19	Providing and fixing 355 X 19 mm adjustable friction window stays of approved quality made from Stainless Steel (SS 304 grade) with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-charge complete.	90	each	450	40 500
675	01AR.4.14.23	Providing and fixing Powder coated aluminium (minimum thickness of powder coating - 50 micron) tubular handle bar 32 mm outer dia, 3.0 mm thick & 2100 mm long with SS screws etc complete as per direction of Engineer-in-Charge.	90	each	530	47 700
676	01AR.4.14.25	Providing and fixing 100mm brass locks (best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	10	each	530	5 300
677	01AR.4.14.27	Providing and fixing Powder coated minimum thickness 50 micron aluminium round shape handle of outer dia 100 mm with SS screws etc. complete as per direction of Engineer in-charge	10	each	92	920

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
678	01AR.4.14.29	Providing and fixing 100 mm long aluminium handles, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete	14	nos	350	4 900
679	01AR.4.14.30	Providing and fixing aluminium tower bolts of size 100mm x 10mm , ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete	110	nos	330	36 300
680	01AR.4.14.31	Providing and fixing toughened glass panes of 6.0 mm thickness in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item)	200	m²	1 850	3 70 000
681	01AR.4.14.32	Providing and fixing laminated glass panes of 6.3 mm thickness in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item)	7	m²	2 470	17 290
682	01AR.4.14.33	Double insulated toughened glass Providing and fixing in aluminium door, window, ventilator shutters and partitions etc. 24mm thick hermetically sealed double insulated toughened glass (6mm high performance toughened glass on outside with reflective soft coating on surface of blue green shade + 12mm dry air gap by a metal spacer filled with dehydrating agent inside the unit to prevent moisture formation between the two panes +6 mm thick clear toughened glass on inside) Glass type -GT3 performance characteristic shall be as given below or better than: (i) Light transmission : 40%-50% (ii) External Reflection : 10-20% (iii) Internal Reflection : 15%-20% (iv) Shading coefficient : <0.28 (v) Solar Factor : <=0.25 (vi) U Value : 1.5 to 1.8 W/m2 degree K with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item). The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement. The glass shall be of SKN/KT series of Saint Gobain make (ECBC Compliant) or approved equivalent	6	m²	8 030	48 180

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683	01AR.4.14.35	Providing and fixing in position decorative Powder Coated Aluminium grill (minimum thickness of powder coating 50 micron), made of approx. 7.5 mm wide, 6mm thick sections with gapping of approx. 85 mm x 70mm maximum of approved design, pattern and make fixed to the outer frame or shutter frame of door/ window/ ventilator with C.P brass/ stainless steel screws @ 200mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved powder coated aluminium standard section around the opening, all complete as per requirement and direction of Engineer-incharge.	60	kg	618	37 080
684	01AR.4.15	P/F pressed steel door and window frames Providing and fixing pressed steel door and window frames of size (assorted size out of) Overall 125mm x 60mm section, of required profile conforming to IS: 4351, made of 16 SWG pressed steel including/ consisting of: i)3 mm thick MS flat spacers welded to frame @ 500mm c/c and at holdfast locations. ii)Filling the hollow frame section with concrete. iii)MS angle (20mmx20mmx3mm) horizontal tie member below floor finish. iv)MS holdfasts (200mmx25mmx6mm) welded to spacers. v)Fixing to masonry (by grouting the holdfasts with M-15 grade concrete in minimum 250mm x 100mm x 100mm sized hole)/ fixing to RCC (by minimum 100mm long, 12 mm dia metallic counter sunk anchor fasteners) vi)MS pad plates (40mm x 150mm x 3mm) & GI mortar guard welded to frame at hinge and other hardware locations. vii)Metering of joints between horizontal and vertical members, grinding and smoothening of welding, cleaning of frame surface, finishing (synthetic enamel painting/ electrostatic powder coating/ polyurethane (PU) coating), making true alignments and surfaces etc. all complete. Notes: 1)Reference shall be made to EIL standard nos. 7-75- 0070, 7-75-0071 2)Cumulative length of all horizontal and vertical frame members shall be measured for payment.				
685	01AR.4.15.5	Frames painted with Electrostatic Powder coating.	110	m	1 780	1 95 800
686	01AR.4.15.6	Extra for box type transoms & mullions	15	m	470	7 050

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
687	01AR.4.16	P/F Gypsum Board/ Calcium silicate board Partitions Providing and fixing partition upto ceiling height consisting of G.I. frame and required board, including providing and fixing of frame work made of special section power pressed/ roll form G.I. sheet with zinc coating of 120 gms/sqm(both side inclusive), consisting of floor and ceiling channel 50mm wide having equal flanges of 32 mm and 0.50 mm thick, fixed to the floor and ceiling at the spacing of 610 mm centre to centre with dash fastener of 12.5 mm dia meter 50 mm length or suitable anchor fastener or metal screws with nylon plugs and the studs 48 mm wide having one flange of 34 mm and other flange 36 mm and 0.50 mm thick fixed vertically within flanges of floor and ceiling channel and placed at a spacing of 610 mm centre to centre by 6 mm dia bolts and nuts, including fixing of studs along both ends of partition fixed flush to wall with suitable anchor fastener or metal screws with nylon plugs at spacing of 450 mm centre to centre, and fixing of boards to both side of frame work by 25 mm long dry wall screws on studs, floor and ceiling channels at the spacing of 300 mm centre to centre. The boards are to be fixed to the frame work with joints staggered to avoid through cracks, M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5 mm each) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corners (25 mm x 25 mm x 0.5 mm), joint finisher and two coats of primer suitable for board as per manufacture¿s specification and direction of engineer in charge all complete.				
688	01AR.4.16.1	75 mm overall thickness partition with 12.5 mm thick double skin fire rated board conforming to IS: 2095: part I	7	m²	1 830	12 810
689	01AR.4.16.2	75mm overall thickness partition with 12.5 mm thick double skin tapered edged plain Gypsum board conforming to IS: 2095: part I	8	m²	1 260	10 080
690	01AR.5	PLASTERING & POINTING				
691	01AR.5.1	Providing plain cement plaster in cement mortar (1 cement:4/6 fine sand by volume) on masonry, PCC/ RCC including preperation of base, finishing, curing etc; also including providing 20 gauge chicken wire mesh stretched tight at all RCC/ PCC and masonry meeting points in 300mm wide strips (150mm on on each surface) fixed with G.I. "U" type nails before plastering.				
692	01AR.5.1.13	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 18mm thick 1:6 (1 cement : 6 sand) Cement supplied by the Contractor at their cost.	2500	m²	600	15 00 000

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693	01AR.5.1.15	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 15mm thick 1:4 (1 cement : 4 sand) Cement supplied by the Contractor at their cost.	2000	m²	540	10 80 000
694	01AR.5.1.17	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 12mm thick 1:4 (1 cement : 4 sand) Cement supplied by the Contractor at their cost.	3000	m²	470	14 10 000
695	01AR.5.1.19	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight. Average 6mm thick 1:4 (1 cement : 4 sand) Average 6mm thick 1:4 (1 cement : 4 sand). Cement supplied by the Contractor at their cost.	2400	m²	400	9 60 000
696	01AR.5.4	Providing 20mm x 10mm Grooves in plastering in perfect straight line, plumb and uniform size throughout including finishing etc. all complete.	1700	RM	90	1 53 000
697	01AR.5.7	Providing and applying 12 mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part - 1 & II) 1976, applied on hacked / uneven background such as bare brick/ block/ RCC work on walls & ceiling at all floors and locations, finished in smooth line and level etc. complete.	35	sqm	410	14 350
698	01AR.6	ROOFING TREATMENT				
699	01AR.6.2	PCC 1:2:4 over concrete surfaces Providing and laying cement concrete (1 cement : 2 coarse sand : 4 aggregate) over concrete surfaces, laid to slope at all heights including, finishing, curing, tamping etc. all				
700	01AR.6.2.1	Cement supplied by the Contractor at their cost.	70	m³	9 870	6 90 900
701	01AR.6.6	Cinder Concrete (1:10) Providing and laying Cinder Concrete (1 cement : 10 cinder of 48mm size and down grade) in all sunk areas finished with 12mm thick plain cement plaster (1 cement : 6 coarse sand by volume) including consolidating, finishing, curing, maintaining slope etc. all complete.				
702	01AR.6.6.1	Cement supplied by the contractor at their cost	6	m³	10 810	64 860

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703	01AR.6.10	P/L one component PU elastomeric membrane roof treatment Providing and laying one component urethane polymers based elastomeric membrane roof treatment/ waterproofing-cum-terracing system consisting of one or more coats of urethane based high solid content elastomeric membrane (having high viscosity to give a high build film) at approx. coverage of 0.5 kg per sq.M each coat applied over and including a coat of urethane primer EMP (cured to a slightly tacky film) at a coverage of 8 Sq.M per litre by brush applied to achieve overall thickness of 1.5 mm (+ or - 15%) as per ASTM C-836/898 over all exposed roof surfaces, continued up the parapets/ walls for a minimum of 150mm over the finished roof surface, continued into rain water pipes by at least 100mm; including the preparation of the surface which shall include thorough cleaning of roof surface with a wire brush and removal of all foreign matter etc.; well defined cracks on the surface cut to ""V"" section, cleaned and filled up with a suitable mastic; sprinkling of 300 micron layer of clean sand over the final coat of PU when tacky; providing finishing protective layer of 50 mm thk. P.C.C. (1:2:4) in panels of maximum size 1200mm x 1200mm chequered finish with 24 SWG chicken wiremesh interposed in between finished smooth with joints between panels sealed with suitable urethane based elastomeric compound as per manufacturer's specifications; providing fillets of 75 mm radius with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; providing 450mm x 450mm khuras (rain water collecting pits) in 1:2:4 cement concrete at all outlets, levelled down by min. 25mm, finishing, curing etc. all complete as per approved manufacturer's standard specifications and recommendations.				
704	01AR.6.10.1	Cement supplied by the contractor at their cost	40	m²	1 490	59 600

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705	01AR.6.12	P/L A.P.P. modified reinforced bituminous memb. waterproofing Providing and laying 4mm thick A.P.P (atactic polypropelene) modified reinforced bituminous waterproofing membrane over terrace and parapet including cleaning and preperation of the surface consisting of making good all the cracks and damages, filling potholes/ depressions, removing weak foam concrete/ plaster and refilling with same wherever required thus preparing smooth surface of the terrace; providing and applying one coat of cold applied bitumen based primer @ 0.2 to 0.4 litre per sq. mtr.; laying the membrane by torch welding over primer, providing 100mm overlaps and appropriately pressing the membrane to remove any entrapped air, including fixing on parapet after providing 10mm x 20mm continuous groove in parapet for terminating the membrane and filling the groove with polyurethane sealant and continuing this treatment at rain water outlet points; providing finishing protective layer of 35 mm thk. P.C.C. (1:2:4) in panels of maximum size 1200mm x 1200mm chequered finish with 24 SWG chicken wiremesh interposed in between finished smooth with joints between panels sealed with suitable polyurethane sealant; providing fillets of 75 mm radius with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; providing 450mm x 450mm khuras (rain water collecting pits) in 1:2:4 cement concrete at all outlets, levelled down by min. 25mm, finishing, curing etc. all complete as per approved manufacturer's standard specifications and recommendations.				
706	01AR.6.12.1	Cement supplied by the contractor at their cost	1200	m²	1 230	14 76 000
707	01AR.7	WHITEWASHING, PAINTING & POLISHING				
708	01AR.7.9	Providing and applying textured wall coating system consisting of twin pack fine grade silica granules/ dry flakes made of special grade of china clay/ granite type flakes of `Heritage' or equivalent in approved shade and texture; mixed in-situ with 100% acrylic polymer bonding agent; applied over plastered surfaces; the granules/ flakes etc., bonding material, mixing, method of application surface preperation etc. all shall be as per manufacturer's recommendations and specifications.				
709	01AR.7.9.1	Providing and applying textured granular type wall coating.	80	m²	650	52 000
710	01AR.7.10	Providing and applying min 2 mm thick white cement and polymer based wall putty (JK Wall care/ Birla Putty/ SARA or approved equivalent) over plastered surfaces (masonry wall/ RCC) and smoothening the surface with sand paper etc., preparation of surface etc. all complete as per the approved manufacturer's recommendations and directions of Engineer-in-charge.	14000	m²	210	29 40 000

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711	01AR.8	ROOFING				
712	01AR.8.10	Providing and fixing 40mm x 6mm M.S. flat wind ties over sheeting with anticorrosive polymer coated G.I. nuts, bolts, polymer cap, seal and thrust washers of approved make iincluding painting with two coats of synthetic enamel paint of approved make over a coat of approved quality red oxide zinc chromate primer etc.all complete.	350	RM	200	70 000
713	01AR.8.12	Providing and fixing rain water pipes with M.S. holder clamps including fixing/embedding into masonry/concrete, providing connections like shoes, vents, specials, bends etc. fixing in perfect plumb etc. all complete.				
714	01AR.8.12.5	110mm dia O.D. Size. exposed PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	18	RM	350	6 300
715	01AR.8.12.6	160mm dia O.D. Size. exposed PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	700	RM	580	4 06 000
716	01AR.8.12.7	110mm dia O.D. Size. embedded PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	18	RM	360	6 480
717	01AR.8.12.8	160mm dia O.D. Size. embedded PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details	18	RM	610	10 980

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
718	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.	3450	m²	1 240	42 78 000
719	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.	1350	m²	1 240	16 74 000
720	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.	380	m²	2 930	11 13 400

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721	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.				
722	01AR.8.24.1	approx. size 700 mm outer dia. with minimum 2500 CFM capacity	3	nos	8 250	24 750
723	01AR.9	SANITARY FITTINGS & FIXTURES				
724	01AR.9.1	Providing and fixing white glazed Earthenware Orissa pan type water closet with integral footrest of 550mmx440mm size conforming to IS : 2556, Part - III including glazed earthenware flushing cistern supported on MS brackets conforming to IS:774 of 10 litre capacity with CP brass handles,32mm dia telescopic flush pipe with fittings & clamps,15 mm dia overflow pipe with mosquitoproof net,15mm dia PVC connection pipe 450mm long,painting of all exposed metalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved qualityred oxide zinc chromate, cutting walls, floors and making good of same,finishing, soldered joints, making inlet/ outlet connections,providing min. 150mm thick sand cushion, finishing etc. all complete.	1	nos	9 870	9 870
725	01AR.9.2	Providing and fixing white glazed Earthen ware double trap, syphonic pattern wash down water closet conforming to IS : 2556 Part II including white plastic solid seat and cover conforming to IS : 2548, CP brass hinges and rubber buffers,10 litres capacity glazed Earthenware low level cistern conforming to IS:774 with internal overflow system & fittings,CP brass 40mm dia flush pipe,15 mm dia ,450mm long PVC connection pipe,ball valve, painting of all exposed matalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, cutting walls, floors and making good of same, making inlet and outlet connections, finishing etc. all complete.	6	nos	11 380	68 280

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726	01AR.9.3	Providing and fixing white glazed ceramic, flat back half stall type Urinals of 610mm x 400mm x 380mm size conforming to IS:2556 Part-VI including automatic glazed Earthenware cistern for every one 15mm dia CP brass cistern outlet 750mm long,32mm dia GI waste pipe with brass union,CP brass bottle trap,CP brass spreader,tee,distribution pipe etc.,MS brackets for cistern, painting of all exposed mettalic surface with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, making inlet and outlet connections, fixing with C.P. brass screws, finishing etc. all complete.				
727	01AR.9.3.1	One urinal.(with 5 litre capacity cistern)	3	nos	12 230	36 690
728	01AR.9.6	Kitchen Sink				
729	01AR.9.6.1	Providing and fixing white glazed vitrous china Lab sink/kitchen sink of 610mm x 450mm x 250mm size conforming to IS : 2556, Part-V including approved M.S./C.I. brackets conforming to IS : 775, one 15mm dia CP brass bibcock, 15mm dia PVC conection, C.P. brass chain with 40mm dia GI pipe connected to floor trap with unions, painting all exposed metallic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate,cutting floor,Walls and making goodgood the same, making all connections, finishing etc. all complete.	3	nos	5 210	15 630
730	01AR.9.8	Glass Shelf				
731	01AR.9.8.1	Providing and fixing 600mm x 120mm x 4mm thick Glass shelf of approved quality with CP brass bracket and guard rails including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc.all complete.	4	nos	1 140	4 560
732	01AR.9.9	Towel Rail				
733	01AR.9.9.1	Providing and fixing approved quality chromium plated brass towel rail of 20mm dia, 600mm length and 1.25mm thickness including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	4	nos	1 710	6 840
734	01AR.9.10	Soap Container				
735	01AR.9.10.1	Providing and fixing approved quality chromium plated liquid soap container including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same,finishing etc. all complete.	5	nos	670	3 350
736	01AR.9.11	Providing and fixing Heavy grade Bib cocks/ stop cocks of spring loaded self closing type conforming to IS : 781 including making connections, cutting walls and making good the same etc. all complete.				
737	01AR.9.11.1	15mm dia CP Brass stop cock.	13	nos	820	10 660

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738	01AR.9.11.2	15mm dia CP Brass bib cock.	8	nos	1 170	9 360
739	01AR.9.13	Providing and fixing CP brass shower rose conforming to IS-2064:				
740	01AR.9.13.2	150mm dia shower rose.	1	nos	1 340	1 340
741	01AR.9.14	Toilet Paper Holder				
742	01AR.9.14.1	Providing and fixing CP Brass Toilet paper holder of approved make with CP brass brackets including fixing to wall with wooden cleats, CP brass screws,cutting walls and making good the same, finishing etc. all complete.	7	nos	870	6 090
743	01AR.9.15	Providing and fixing in position round/ oval shaped counter Hand Wash Basin with anti-splash rims, conforming to IS:2556 Part IV, to fit in exactly and neatly in the cutout in the marble/ granite stone finished R.C.C counter; one 15mm dia CP brass pillar cock, rubber plug with C.P. brass chain, 32mm C.P. waste fitting of standard pattern type with 32mm dia G.I. pipe, C.P. brass bottle trap, cutting walls, counter etc. and making good the same, also including providing cut out in marble/ granite slab counter top (and R.C.C underneath) of exact size and shape for wash basin to fit in neatly and perfectly; making all connections, finishing etc. all complete. (Marble/ Granite counter top shall be paid seperately under relevant item of `Floor Finishing')				
744	01AR.9.15.2	Providing round/ oval shaped counter Wash Basin of glazed chinaware in approved colour.	5	nos	11 240	56 200
745	01AR.9.16	Stainless steel Kitchen/ Laboratory sink				
746	01AR.9.16.1	Providing and fixing stainless steel Kitchen/ Laboratory sink of approx. Size 610mm x 450mm x 200mm made of min. 1mm thick stainless steel sheet of `Salem Steel' or equivalent supported on and including M.S. brackets conforming to IS: 775; one 15mm dia C.P brass long body bib cock (if fixed to wall) or swivel type pillar cock (if fixed to counter), 15mm dia PVC/ G.I. connections to floor trap with unions etc.; painting all exposed metallic surfaces with min. 2 coats of synthetic enamel paint of approved make and shade over acoat of red oxide zinc chromate primer; cutting floor, walls, counter etc. and making good the same, making all connections, finishing etc. all complete.	5	nos	10 790	53 950
747	01AR.9.17	17mm thick polished granite stone partitions				
748	01AR.9.17.1	Providing and fixing minimum 17mm thick polished granite stone partitions (in approved quality, shade and design/ shape) with round edges for urinals including cutting walls, inserting (up to 100mm depth) and fixing the slab with Cement Mortar (1 cement : 3 coarse sand by volume), making good of all damaged work, finishing etc. all complete	5	m²	6 140	30 700
749	01AR.9.18	round edged mirror of 6mm thick				

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750	01AR.9.18.1	Providing and fixing round edged mirror of 6mm thick float glass with 6mm thick waterproof marine ply backing and rounded/ beveled edging, fixed on wall with wooden cleats and CP brass screws including cutting walls/ tiles, making good the same, finishing etc. all complete.	7	m²	2 180	15 260
751	01AR.9.19	CP Brass hand shower				
752	01AR.9.19.1	Providing and fixing CP Brass hand shower (health Faucet, of Jaquar or approved equivalent) with 8 mm Dia, 1 metre long PVC Tube and Wall hook in approved colour and finish with all necessary fittings etc. all complete.	7	nos	990	6 930
753	01AR.9.20	chromium plated brass towel ring				
754	01AR.9.20.1	Providing and fixing approved quality chromium plated brass towel ring of 150mm dia including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	7	nos	1 440	10 080
755	01AR.9.21	chromium plated brass towel rack				
756	01AR.9.21.1	Providing and fixing approved quality chromium plated brass towel rack with towel rail, of 250mm width and 600mm length including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	3	nos	3 230	9 690
757	01AR.9.23	white glazed Earthen ware double trap, syphonic pattern wall mounted (European type) wc				
758	01AR.9.23.1	"Providing and fixing white glazed Earthen ware double trap, syphonic pattern wall mounted (European type) water closet conforming to IS: 2556 Part 16 including white plastic solid seat and cover conforming to IS : 2548, CP brass hinges and rubber buffers, CP brass 40mm dia flush pipe,15 mm dia, ball valve, painting of all exposed metalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, cutting walls, floors and making good of same, making inlet and outlet connections, finishing etc. all complete.	5	nos	14 610	73 050
759	01AR.9.24	white glazed ceramic, flat back half stall type Urinals sensor based				
760	01AR.9.24.1	"Providing and fixing white glazed ceramic, flat back half stall type Urinals of 610mm x 400mm x 380mm size conforming to IS:2556 Part-VI, having electronic, battery operated sensor based flushing system of approved make and model including 32mm dia GI waste pipe with brass union, CP brass bottle trap, CP brass spreader, tee, distribution pipe etc., painting of all exposed metallic surface with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, making inlet and outlet connections, fixing with C.P. brass screws, finishing etc. all complete.	5	nos	18 970	94 850
761	01AR.9.25	C.P. brass 2 way bib cock quarter turn type for health faucet				

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762	01AR.9.25.1	Providing, fixing, testing and commissioning C.P. brass 2 way bib cock quarter turn type for health faucet of approved make or equivalent 15 mm nominal bore, all complete as per standard design, specifications and direction of Engineer-in-charge.	3	nos	2 070	6 210
763	01AR.9.26	C.P. brass wall mount Lavatory faucet mixer for wash basin				
764	01AR.9.26.1	Providing, fixing, testing and commissioning C.P. brass wall mount Lavatory faucet mixer for wash basin of following make or approved equivalent 15 mm nominal bore, all complete as per standard design, specifications and direction of Engineer-in-charge.	5	nos	3 420	17 100
765	01AR.9.27	Glass shelf				
766	01AR.9.27.1	"Providing and fixing 600mm x 120mm x 6mm thick Glass shelf of approved quality with 'D' or 'F' bracket (Stainless Steel 202 grade) and guard rails including fixing to wall with plastic rawl plugs and SS screws, drilling walls and making good the same, finishing etc., all complete.	5	nos	1 540	7 700
767	01AR.9.28	Providing and Fixing Concealed Flushing Cistern Size 550X95X500mm with dual flush Actuator, flush-stop function, noise less float valve and fast filling action with all component parts of high quality complete including frame for concealed cistern etc. all complete as per the instructions of the engineer-incharge.	5	nos	7 840	39 200
768	01AR.9.29	Providing and Fixing of Flushing plate with dual knobs chrome Finish in desired shape and size for Concealed Flushing Cistern including all tools, tackles etc., all complete as per the instructions of engineer-in-charge.	5	nos	1 240	6 200
769	01AR.10	FALSE CEILING, FALSE FLOORING, UNDERDECK INSULATION, PARTITIONING				
770	01AR.10.1	Providing and fixing False Ceiling grid framework for supporting ceiling tiles consisting of main and cross runners supported from roof slab at desired height in desired pattern including finishing, making the frame work perfectly levelled and aligned etc. all complete.				
771	01AR.10.1.1	Anodised (25 micron) aluminium grid framework consisting of extruded anodized aluminium (2.50mm thick) main runners (`T'shaped, 25mm x 35mm size), cross runners (`T'shaped 25mm x 25mm size),Wall angles including suspending the main runners @ 600mm c/c max, by means of 6mm dia M.S. hooks slotted in 25mm x 25mmx3mm thick M.S. angle fixed to roof slab with dash fasteners and connected to 3mm thick M.S. clamp (connected to main runners with 25mm long M.S. Nut) with levelling nut @ 1200mm c/c max. assembling the main and cross runners by means of aluminium angle cleats inter locking each other to forn the grid work of 600mm of 600mm size (max) fixing the aluminium wall angles with dash fastners etc. all complete.	650	m²	1 090	7 08 500

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772	01AR.10.3	Providing and fixing Mineral Fibre Tile false ceiling consisting of A. 600mm x 600mm x 15mm thick Mineral Fibre Acoustical tiles with durable tegular edging having noise reduction coefficient (NRC) value of min. 0.50, light reflectance value of min. 80%,thermal conductivity (K) value of 0.052-0.057 w/m deg.C and fire performance conforming to class-I as per BS-476,back of the tiles being provided with one coat of protective coating. B. Suspension system consisting of hot dipped galvanised steel main runners @ max. 1200mm c/c (0.33mm thk.,"T"shaped, 24mm x 38mm size with single rotary stiching), cross runners (0.25mm thk.,"T" shaped with double rotary stiching, 24mm x 30mm size, 1200mm long and 24mm x 25mm size, 600mm long), perimeter sections (0.45mm thick,22mm x 22mm size) including suspending the system by means of 4mm dia MS wire,6mm thk. MS cleat of 25mm x 25mm size, dash fasteners and level adjustors, providing 30 micron powder coating to exposed metallic members, providing slit openings for fixing supply/return air grill, lighting fixtures, AC ducts etc. all complete.				
773	01AR.10.3.2	With fine granulated surface tiles (Acoustical punchers (10mm deep) = 24000sm)	1000	m²	1 780	17 80 000
774	01AR.10.7	Providing and fixing partition/ panelling boards over MS framework as per desired pattern including providing cut-outs for fixing wall fixtures, conduits etc. all complete.				
775	01AR.10.7.3	12.5mm thick Gypsum board panels in partition (conforming to IS : 2095, having thermal conductivity of 0.16w/mk, thermal resistance of 0.085sq.m k/w, categorised as Class-1, when tested to BS 476 Part-7) painted and screw fixed to the GI framework with 12.5mm dia dry wall screws @ 230mm c/c, including finishing the joints in the board flush with fillers, to give a smooth, seamless joints, cleaning of surfaces, fixing etc. the panels being fixed on both sides of frame work including providing and fixing Gypsum boards along the exposed edges of frame work and painting the boards with aproved shade plastic emulsion paint conforming to IS:5411.	35	m²	1 470	51 450
776	01AR.10.7.4	12.5mm thick Gypsum board panels in panelling (conforming to IS : 2095, having thermal conductivity of 0.16w/mk, thermal resistance of 0.085sq.m k/w, categorised as Class-1, when tested to BS 476 Part-7) painted and screw fixed to the GI framework with 12.5mm dia dry wall screws @ 230mm c/c, including finishing the joints in the board flush with fillers, to give a smooth, seamless joints, cleaning of surfaces, fixing etc. the panels being fixed on one side of framework only and painted with approved shade plastic emulsion paint conforming to IS:5411.	35	m²	1 490	52 150
777	01AR.10.7.5	5.5mm thick toughened glass panels (conforming to IS :5437) in partitions with putty, 12mm x 10mm second T.W beading on Teak Wood frame (50mm x partition depth) fixed to MS frame work in the partition including adjustment of partition members, finishing etc. all complete.	23	m²	920	21 160

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778	01AR.10.9	Tray type Aluminium plank false ceiling				
779	01AR.10.9.1	Providing and fixing Tray type Aluminium plank false ceiling consisting of 254/305mm x 1264mm or 600mm x 600mm size Aluminium planks (profiled for positive engagement into clip-in profiles and demounting of individual planks) manufactured out of 0.7mm thk. Aluminium alloy 3105/3005/5052 (as per ASTM 209M) with stove enamelled (coil coated) finish in approved colour and suspension system consisting of 0.5mm thk. 40mm x 20mm galvanised steel clip-in main runner profiles (@ 1264mm or 600mm as per plank size) supported by and including 0.5mm thk. 25mm x 16mm GI suspension angle,1mm thk. 25mm x 34mm x 76mm CRCA zinc plated steel ceiling brackets (@ max. 1264mm c/c or 600mm as per profile) fixed to roof slab/beam,0.5mm thk. 40mm wide, 105mm high G.I. hold on clamps slotted for level adjustment, perimeter angles including providing slit openings for fixing supply/return air grill, lighting fixtures, AC ducts etc. all complete. .	1200	m²	2 520	30 24 000
780	01AR.10.12	underdeck insulation consisting of rigid Polyisocyanurate foam (PIR) slabs				
781	01AR.10.12.1	Providing and fixing in position underdeck insulation consisting of rigid Polyisocyanurate foam (PIR) slabs of size 1000 x 500mm and thickness of 30mm (covered on one side with glass fibre tissue/ Aluminium foil having 50mm overlap) conforming to IS:12436 having density not less than 32 kg./ Cu. M., thermal conductivity (K- value) not more than 0.023 w/mk measured at 10 deg. C; classified as 'Class I' for surface spread of flame as per BS 476, part 7; fixed to R.C.C. slab by hot blow grade bitumen of 85/25 grade or cold adhesive CPRX applied over a coat of bituminous primer @ 0.5 Litres/ Sq.M. applied to bare R.C.C. surface and to the two surface of each PIR panel and pressed in position (while the bitumen is still tacky) with the help of G.I. screws (No. 8 x 75mm long) fixed into rawl plugs (holes in R.C.C. for the rawl plugs shall be drilled prior to applying coat of bituminous primer) of size 8 x 25mm inserted (5 nos. for each slab- One each at 4 corners and one at center) and G.I washers 25mm dia; including covering the overlaps with approved quality sealing compound (MAS-94 or equivalent); chicken wire mesh 24G x 19mm shall then be fixed to G.I screws and tightened with lacing wire; including preparation of surface consisting of cleaning R.C.C surface of all dust, dirt and loose particles by wire brushing; etc. all complete as per approved manufacturer's standard specifications and recommendations.	1200	m²	1 420	17 04 000

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782	01AR.10.15	Providing and installing/ fixing in position 600mm-1000mm high truly levelled and aligned cavity/ false flooring system having load bearing capacity of uniformly distributed load of minimum 2025 kg/ sq.m. and point load of 675 Kg., the system consisting of: (i) Sub-structure/ pedestal assembly (designed for speedy assembly/ removal for relocation/ maintenance) of zinc electro plated steel comprising of: a. 90mm x 90mm x 4mm embossed pedestal head attachment mechanically riveted to a 90mm long, minimum 19mm dia threaded bright M.S. rod stud with check nuts for level adjustment (for upto 25mm) and arresting vertical movement, anti-vibrational PVC cap (for panel and stringer location), b. CRCA (Electrical resistant welded) Pedestal of 32mm dia (OD), 2mm thick pipe mechanically reduced to four ribs at top to accommodate head assembly, mechanically locked to maintain true plumb welded to pedestal base plate. c. Pedestal Base plate 150mm x 150mm x 4mm thick (with stiffening folds) fixed/ anchored to main concrete floor @ 600mm c/c both ways (for installing flooring tiles) by means of adhesive or fastener as recommended by Manufacturer. (ii) Stringers of minimum sectional size 20mm x 32mm x 1.2mm made of hot dip galvanized steel cold rolled construction with ribs embossed on 3 sides (designed for strength, lateral stability, rolling loads and to support panels on all four sides for alignment), having counter sunk holes at both ends for fixing to pedestal head assembly with M6 machine screws. (iii) Removable and re-usable Floor panels of size 600mm x 600mm made of all steel welded construction (cleaned, degreased and phosphated with 11 tank process, finished with 40-60 micron epoxy coating (and, heated to achieve adhesion to the panel surface and corrosion resistance) with bottom surface consisting of multiple hemispherical and reverse cones and top plain sheet (fuse welded at 120				
783	01AR.10.15.1	False flooring panels with 2mm thick fire retardant floor grade high pressure laminate conforming to BS : 476 part - 7 on a semi-automated lamination line in approved design/ shade/ texture.	50	m²	10 910	5 45 500
784	01AR.10.15.3	False flooring panels with minimum 10mm thick polished mirror or mat finished vitrified tiles in approved design/ shade/ texture.	1200	m²	7 610	91 32 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
785	01AR.10.17	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recomme-nded jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer¿s specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with:				
786	01AR.10.17.2	12.5 mm thick tapered edge gypsum fire resistant board conforming to IS: 2095- Part I	500	m²	1 910	9 55 000
787	01AR.10.17.3	12.5 mm thick tapered edge gypsum moisture resistant board	70	m²	1 690	1 18 300
788	01AR.11	MISCELLANEOUS ITEMS				
789	01AR.11.1	Sealing 25mm thick, 50mm wide expansion joints with premium grade two part poly-sulphide sealant (based on LP liquid sulphide) over and including primer (specially developed for use with polysulphide sealant material and as approved) and back-up materials of polyethylene strip or other bondbreaker (all as per manufacturer's specification), sealant being mixed (the base and the curing agent thoroughly mixed with slow speed electric mixer) and applied by sealant gun and `sealant application kit' including drying of surfaces before application by wire brushing, finishing etc. all complete.	80	RM	390	31 200
790	01AR.11.6	Providing and laying plinth protection with Bldg. drain as per EIL STD. No. 7-75-0065 consisting of				
791	01AR.11.6.1	Plinth protection of PCC (1:3:6) laid over rammed earth to slope and trowel finished. Cement supplied by the Contractor at their cost.	600	m²	900	5 40 000

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792	01AR.11.6.3	Building drain consisting of brick work, PCC (1:3:6) laid over rammed earth and finished with 15mm thick plain cement plaster topped with neat cement finish @ 2.75kg. of cement per Sq.M of area including finishing curing etc. all complete. Cement supplied by the Contractor at their cost.	250	m²	4 090	10 22 500
793	01AR.11.6.6	Extra for providing 600mm long MS grating drain cover as per EIL STD No. 7-75-0065 made of 40mm x 6mm M.S. flat framework with 40mm x 6mm MS flats welded @ 35mm c/c including providing & fixing 50mm x 50mm x 6mm M.S. angle frame fixed to concrete portion of the drain.	550	nos	1 950	10 72 500
794	01AR.11.7	50mm dia GI pipe spouts				
795	01AR.11.7.1	Providing and fixing in position 50mm dia GI pipe spouts to slope for drainage of canopy, chajja etc., including puncturing the masonry /RCC and grouting with M-15 grade concrete, finishing etc. all complete.	4	RM	1 920	7 680
796	01AR.11.10	Providing and laying cinder concrete filling in sunk slabs of Toilets etc. consisting of -				
797	01AR.11.10.1	Average 18mm plain cement plaster (1 cement : 6 sand by volume) with waterproofing compound conforming to IS : 2645 mixed @ 3% by weight over RCC slab including preparing the base surface, finishing with one floating coat of neat cement slurry @ 2.75 Kg. of cement per Sq.M of area, including curing, finishing etc. all complete. Cement supplied by the Contractor at their cost.	2.5	m²	730	1 825
798	01AR.11.10.3	Cinder concrete (1 cement : 10 cinder of 12mm size and down grade) over cement plaster including consolidating, finishing, curing, maintaining slope etc. all complete.Cement supplied by the Contractor at their cost.	3	m³	10 810	32 430
799	01AR.11.11	Silicon/acrylic based water repellant finish				
800	01AR.11.11.1	Providing and applying one coat of silicon/acrylic based water repellant finish as per aproved manufacturer's specifications on wall surfaces including filling all cracks with white cement and matching pigment cleaning the surface of all dust before evenly applying with brush, curing, drying the coated surfaces for 24 hours etc. all complete.	7	m²	230	1 610
801	01AR.11.21	Transformer gates/ fencing				

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802	01AR.11.21.1	Providing and fixing Transformer gates/ fencing made of 50mm x 50mm x x 4.5mm M.S. tubular frame, 40mm x 40mm x 3.2mm M.S. tubular stiffeners, 50mm x 50mm x 8 gauge welded mesh fixed to the frame by 20mm x 3mm M.S. flat beading on either side, including fixing the gate and frame to the masonry/ R.C.C. by M.S. hinge arrangement (consisting of fabricated hollow M S Cylinder made of 5 Thk MS plate with 20 internal dia fixed to the shutter & RCC/masonry by means of 2 nos 6 Thk MS Flats welded on it.) with M.S. holdfast grouted with M-15 concrete block with gate having M.S. pivot arrangement (ensuring smooth operation of the gate), one heavy duty 450mm long M.S. aldrop, heavy duty M.S. tower bolts etc. including finishing of the entire gate/ fencing with fittings/ fixtures/ accessories with two or more coats of synthetic enamel paint of approved make and shade over a coat of approved red oxide zinc chromate primer, all complete as per EIL-STD No 7-75-0051 rev-04 & 7-75-0052 rev-03.(All above materials to be procured by contractor)	35	m²	6 700	2 34 500
803	01AR.11.22	1000 mm high satin finish stainless steel (SS 304 grade) tubular railing				
804	01AR.11.22.1	Supplying, assembling and installing 1000 mm high satin finish stainless steel (SS 304 grade) tubular railing of approved design in staircases, ramps, around floor cut outs etc. consisting of: 1. 50mm dia SS pipe top handrail 2. 32 mm dia SS pipe balusters (at every third step for staircase, @ maximum 1200mm c/c for ramp, floor cutouts) 3. 3 nos minimum 18mm dia SS pipe intermediate handrails. Including: 1. Fixing balusters to floor with 4 nos bolts änd 8mm thick, 100mm dia SS base plate & SS cap/collar. 2. Fixing top handrail to the balusters with 12mm dia SS bar connector & 6mm thick SS saddle plate. 3. Fixing intermediate handrails to the balusters with 12mm dia SS bar connector. 4. All end caps, decorative caps over balustrades,necessary bending, welding, polishing of all welded joints (Length of top handrail shall be measured for payment).	260	RM	4 800	12 48 000

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805	01AR.11.25	Providing and fixing Toilet cubicle system of overall height of 2000mm made out of 18 and 12 mm thick compact laminated board , in select colours as per manufacturer shade card, with 18mm thick front panels and doors with SS U-section top rail on top side for better rigidity to be supported by adjustable SS leg 100 to 150 mm height, 12mm thick continuous divider/ intermediate panels of maximum depth 1500 mm without any joints fixed to wall and front by using U profile, door size 600 x 1800 (for handicap toilet 900 x 1800) with front panel cut and fixed as per the requirement, maximum width of the front panel including door to be 1100 mm (for handicap toilet 1600mm provided with a 10 x 10mm rebate on both the sides of door and front panel with 2mm thick silicon rubber lining pasted in the rebate for noise reduction of the door. Each cubicle shall be equipped with the following necessary hardware: SS316 - primary thumb turn/ indicator lock - 1no. SS316 - Door know. Handle set - 1 no. SS316 - Coat hoos - 1 no. SS316 - Auto reverse hinge with cap - 3 nos. SS316 - 150 mm height adjustable leg - 2 nos. SS316 - l-bracket, corner fixing wherever required. The square meter area of from panels and doorMode of measurement - Square meter basis , front panel and door measurement will be taken from wall to wall and floor to top rail, divider measurement to be taken from wall to front and the total height of the divider.				
806	01AR.11.25.1	Area of front panels and door measured from floor to top rail	5	m²	12 890	64 450
807	01AR.11.25.2	Area of divider/ intermediate panel measured as/actual	5	m²	4 620	23 100
808	01AR.11.26	Steel Entrance Gates				
809	01AR.11.26.1	Providing and fixing in position Steel Entrance Gates consisting of 40mm x 80mm x 3.2mm M.S. tubular frame, 80mm x 40mm x 3.2mm rectangular M.S. hollow sections & 32x32x2.6 mm MS rectangular hollow sections, both horizontal & vertical members welded to the framework and intermediate curved rectangular hollow section as per standard design, locking arrangement, 25mm thick, 75mm dia M.S. wheel with ball bearing including fixing the gate to RCC/ masonry by M.S. hinge arrangement (fabricated/ machined as per detail) and M.S. hold fast (25 x 6 x 200mm long) grouted with M-20 grade concrete, providing and fixing M.S. pivot, 50mm x 50mm x 6mm M.S. Tee bent to shape and embedded in road surface for gate opening track, gate stopper, painting the gate with approved shade and quality synthetic enamel paint (two coats) and a coat of approved quality primer, ensuring smooth operation of the gate etc. all complete as per EIL- STD-No. 7-75-0054.	5	m²	8 360	41 800
810	01AR.12	LANDSCAPE CIVIL WORKS				

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811	01AR.12.1	EARTHWORK Supplying and filling in good quality earth including fine dressing to levels specified, watering, ramming consolidating and dressing etc. all complete.	3	m³	560	1 680
812	01AR.12.2	HARDCORE FOR SUB BASE Providing and laying HARDCORE sub base with stone aggregate 63 to 40mm size and approved binding material including screening, sorting, spreading, packing and consolidation with half tonne roller to template etc. all complete.	3	m³	2 700	8 100
813	01AR.12.3	GUNITED SPRAYED CONCRETE WATERPROOFING Providing and laying GUNITED SPRAYED CONCRETE WATERPROOFING (40mm thk.) in Waterbody areas consisting of mix 1:2:4 (1 cement: 2 coarse sand: 4 coarse aggregate of 10mm nominal size) over G.I. Wire mesh of approved weight per sq.m. using appropriate equipment & the following operations: a) Cleaning the surfaces where gunited concrete is to be applied, b) Fixing of G.I. wire mesh with approved fasteners on surface, c) Applying sprayed concrete d) Finishing the surface with trowel to achieve smooth finish etc. all complete.	20	m²	1 620	32 400
814	01AR.12.4	FINISHES FOR ROAD & PARKING AREA				
815	01AR.12.4.1	Providing and laying approved GRANITE COBBLE STONE (shotblasted finish, size 100x100x100mm thk. or as/ design) as per approved pattern used in drop off areas, laid over 100mm thk. PCC base & well compacted sub base/ WBM as per approved paving pattern including rubbing, polishing and grout etc. all complete.	20	m²	4 330	86 600
816	01AR.12.4.3	Providing and laying of approved INTERLOCK PAVERS (rough finish with solar reflectance index value higher than 0.5, size 100x200x80mm or as/ design) in road and parking area bands, laid over 100mm thick sand base over well compacted subbase/ WBM and mortar with joints filled in fine sand as per manufactured requirements etc. all complete.	18	m²	810	14 580
817	01AR.12.4.4	Supplying and laying CONCRETE INTERLOCKED GRASS PAVERS laid over 100mm thk. sand base over well compacted subbase/ WBM and mortar with joints filled in fine sand as per manufactured requirements etc. all complete.	18	m²	1 250	22 500

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818	01AR.12.4.5	Supplying and laying of POLYCARBONATE GRASS TRACK PAVERS (Ovilite or equivalent) with self anchoring pegs, made of high impact resistant HDPE. The base of the panel is equipped with a slot opening for drainage. The grass paver to have interlock system to lock each other and should have compressive strength of minimum 150 tons/sq.m., capable to take the load of the fire tender, should have high level of porosity greater than 90%, porous for grass, shrubs and low planters laid over 50mm sand bed over well compacted subbase/ WBM as per manufacturer specifications etc. all complete.	18	m²	1 500	27 000
819	01AR.12.6	CLADDING AND COPING				
820	01AR.12.6.5	Providing and fixing approved GLASS MOSAIC TILES (Color - Shades of blue, Size - 20x20x6mm or as/ design, Bisazza or equivalent) used in waterbodies, fixed with approved low VOC content adhesive including rubbing, polishing and grout etc. all complete.	18	m²	3 080	55 440
821	01AR.12.7	MISCELLANEOUS FINISHES				
822	01AR.12.7.1	Providing & laying 50-70mm dia polished white Indian MARBLE PEBBLES laid loose in layers including rubbing, polishing, etc. all complete.	18	m²	3 410	61 380
823	01AR.12.7.2	Providing and applying approved EPOXY PAINT of required shade on steel work (two or more coats) as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. all complete.	18	m²	210	3 780
824	01AR.12.8	PERGOLA/ TRELLIS				
825	01AR.12.8.1	Providing and fixing of STAINLESS STEEL SECTIONS (Size of members- 30x30,50x100mm, 75x100mm, 75x150mm, 100x200, 150x150, 150x300mm or as/ design) for pergola framework covered with 2mm dia S.S. wiremesh fixed with frame including cutting, hoisting, fixing in position using structural steel etc. all complete as required.	18	m²	5 310	95 580
826	01AR.14	CLADDING,FACADES ETC.				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
827	01AR.14.2	Providing and fixing in position minimum 25mm thick granite stone (in dry cladding) of uniform colour and size by means of Stainless steel clamps (of Hilti/ approved equivalent make) of minimum weight 250 gms and of minimum 5mm thickness with various offset lengths from 50-65mm and 80-120mm, fastening the clamps with ETA approved universal anchors and pins etc. (of Hilti/ approved equivalent make) for fixing/ anchoring in masonary/ RCC using sufficient number of clamps/ anchors/ pins all as per approved manufacturer's standard details and fixing sequence/ methodology to ensure stable cladding system (with a guarantee for a time span of not less than 15 years) including sealing the joints with polyurethane based adhesive sealant ('SIKAFLEX 11FC of SIKA India Pvt. Ltd' or approved equivalent) and applying one or more coats of Silicon based water repellant coat ('SIKAGUARD 703W of SIKA India Pvt. Ltd' or approved equivalent) on front side of the stone cladding incl. cost of scaffolding etc. complete in all respect for all heights as per the instruction of Engineer-in-charge.				
828	01AR.14.2.1	Granite stone dry cladding with clamps of 304 hybrid grade (of Hilti/ approved equivalent make).	4	m²	5 130	20 520
829	01AR.14.3	Providing, supplying and installing at site Glass Reinforced Concrete (GRC) Claddings, made up of mainly White Cement (conforming to ASTM C 150), High Silica sand (conforming to ASTM c144), AR Glassfibre, Admixtuers (conforming to ASTM c260,ASTM c618), by using Spray Process and as recommended by PCI (Precast Institute) USA, Manual 128 (edn4) or as per GRCA International specifications with design as per details provided in drawings and site requirements/ measurements and as per approved finish and color shade, with sealers and hardwares required, all in accordance with the manufacturer's specifications and conforming to Indian/ ASTM standards, along with submission of shop drawings for approval, complete in all respects.	4	m²	6 850	27 400
830	01AR.14.4	Providing, supplying and installing at site Glass Reinforced Concrete (GRC) Jallis (Grills), made up of mainly White Cement (conforming to ASTM C 150), High Silica sand (conforming to ASTM c144), AR Glasfibre, Admixtuers (conforming to ASTM c260,ASTM c618), by using Vibration Cast Premix Process and as recommended by PCI (Precast Institute) USA, Manual 128 (edn4) or as per GRCA International specifications with design as per details provided in drawings and site requirements/ measurements and as per approved finish and color shade, with sealers and hardwares required, all in accordance with the manufacturer's specifications and conforming to Indian/ ASTM standards, along with submission of shop drawings for approval, complete in all respects.	3	m²	6 900	20 700

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
831	01AR.14.5	Designing, engineering, providing and fixing in position fully sealed and air, water and weather tight structural glazing system comprising of framing system (mullions, transoms etc.) made from extruded, powder coated (min. 30 microns in approved colour) aluminium alloy HE9WP (conforming to IS:733) of commercial quality, free from all defects/ impairing appearance especially selected to fulfil the design requirements spelt out in the specifications; machine cut glass infill panels (of size as per the design) made of minimum 6mm thick hard coated (Glaverbel Stopsol or approved equivalent in approved shade) reflective toughened glass, the glazed framing panel formed by means of special structural quality silicone adhesive sealant applied on all four sides (between glazing panel unit and aluminium alloy framing system) and fixed to framing system. The item includes fixing the framing system to the RCC framed structure/ masonry walls by providing and fixing necessary Aluminium brackets (with flexible joints); with other fastening devices like bolts, anchors, etc. (made from Stainless Steel grade 316, rivets and pins of aluminium alloy of appropriate grade as required) self locking type and torque tightening type; also including providing smooth membrane of Teflon (Min. 1.0 mm thickness), providing (at all joints of the framing, glazed panels as well as joints between aluminium frame with concrete and/ or masonry) of adhesive silicon sealant and superior quality approved make EDPM gaskets, cleaning etc. all complete.	130	m²	9 520	12 37 600

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
832	01AR.14.6	Providing and erecting/ fixing/ installing in position aluminium composite panels system (for external application) of 'Alucobond'/ 'Eurobond'/ 'Reynobond' or approved equivalent comprising of aluminium framework consisting of 40mm x 40mm x 4mm thick x 100mm long aluminium angle cleats (bracket) suitably spaced and placed to comply to design/ elevation/ colour pattern etc. and fixed to masonry/ RCC column/ beam of the building by means of M8 x 65mm long G.I Anchor bolts, aluminium continuous vertical angle 40mm x 40mm x 4mm fixed/ bolted to angle cleats by means of M8 x 25mm long nut and bolt arrangement, suitable horizontal aluminium angle horizontal members as required; cladding panels 4mm thick (overall thickness) made of high quality extrusion grade LDPE/ LLDPE core material (3mm thick) sandwiched between 0.5mm thick aluminium foil (on either side) made of aluminium alloy 1100-H18 or approved equivalent and finished with minimum 35 micron (5 micron primer and 25 micron top coat) thermoplastic PVDF layer 'Kynar 500' (minimum 70%) and polyester coating in approved shade; all complete including providing approved silicon sealant at all joints, necessary accessories like backing rods, aluminium pop rivets, bolts, screws, corner pieces etc. as required for the completion of the work as per the approved manufacturer's specifications and recommendations, cleaning, finishing etc., all complete.	110	m²	4 230	4 65 300

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
833	01AR.14.8	Structural glazing system with DGU Designing, engineering, providing and fixing in position fully sealed and air, water and weather tight Structural glazing system comprising of framing system (mullions,transoms etc.) made from extruded, powder coated (min. 30 microns in approved colour) aluminium alloy HE9WP (conforming to IS:733) of commercial quality, free from all defects/ impairing appearance especially selected to fulfil the design requirements spelt out in the specifications; 24mm thick hermetically sealed double insulated toughened glass (6mm high performance blue green shade toughened glass on outside + 12mm dry air gap by a metal spacer filled with dehydrating agent inside the unit to prevent moisture formation between the two panes +6mm thick clear toughened glass on in side) Glass type -GT3 performance characteristic shall be as given below or better than: (i) Light transmission : 40%-50% (ii) External Reflection : 10-20% (iii) Internal Reflection : 15%-20% (iv) Shading coefficient : <0.28 (v) Solar Factor : <=0.25 (vi) U Value : 1.5 to 1.8 W/m2 degree K (of size as per the design), the glazed framing panel formed by means of special structural quality silicone adhesive sealant applied on all four sides (between glazing panel unit and aluminium alloy framing system) and fixed to framing system. The item includes fixing the framing system to the RCC framed structure/ masonry walls by providing and fixing necessary Aluminium brackets (with flexible joints); with other fastening devices like bolts, anchors, etc. (made from Stainless Steel grade 316, rivets and pins of aluminium alloy of appropriate grade as required) self locking type and torque tightening type; also including providing smooth membrane of Teflon (Min. 1.0 mm thickness), providing (at all joints of the framing, glazed panels as well as joints	35	m²	9 740	3 40 900
834	01AR.14.9	Extra for top hung open out (openable) window panel Extra over structural glazing for providing and fixing top hung open out (openable) window panel including providing and fixing of two point locking handles of approved design, heavy duty aluminium approved quality hinges with concealed 4 points peg stay of aluminium or heavy duty friction stay of approved make suitable to withstand the required wind pressure and shutter loads all fittings and fixtures to be concealed except hinges/stay and handle, complete in all respects with necessary hardware and fittings such as friction hinges, lockable handles etc.of approved make. (Weight of aluminium frame, excluding rough ground, shall be taken as 3.0 Kg. Per sq m)	4	m²	4 200	16 800
835	01AR.16	Fire rated Doors/ Windows and Partitions				

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
836	01AR.16.3	P/F Fire rated Single glazed door with panic bar Providing and fixing 2 hours fire rated, fully glazed, single shutter doors consisting of steel door frame, shutter including stiles, rails, insulation, transparent glass, sealant and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per Specification and approved Manufacturer's details.	9	m²	50 170	4 51 530
837	01AR.16.4	P/F Fire rated Double glazed door with panic bar Providing and fixing 2 hours fire rated, fully glazed, double shutter doors consisting of steel door frame, shutter including stiles, rails, insulation, transparent glass, sealant and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per Specification and approved Manufacturer's details.	18	m²	53 310	9 59 580
838	01AR.16.5	Fire rated Single Steel door without panic bar Providing and fixing 2 hours fire rated, single shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, door closer, motice lock, handle, door stopper including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	4	m²	12 540	50 160
839	01AR.16.6	Fire rated Double Steel door without panic bar Providing and fixing 2 hours fire rated, double shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, door closer, motice lock, handle, door stopper including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	4	m²	12 960	51 840
840	01AR.16.7	Fire rated Single Steel door with panic bar Providing and fixing 2 hours fire rated, single shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt etc. including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	19	m²	14 510	2 75 690
841	01AR.16.8	Fire rated Double Steel door with panic bar Providing and fixing 2 hours fire rated, double shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	35	m²	17 640	6 17 400

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
842	01AR.16.9	Fire rated glazed partition Providing and fixing 2 hours fire rated, glazed partition of desired design consisting of steel frame, insulation and transparent glass and glazing beading, matrix mineral boards, intumescent putty, fire resistant acrylic sealant etc. all complete including preparing fabrication/ installation drawings including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	10	m²	41 970	4 19 700
843	01AR.MF03	MISCELLANEOUS				
844	01AR.MF03.01	Aluminium louvered window/ventilator of minimum 2mm thick, overall 75mm wide approved shade electrostatically powder coated Aluminium sheet louvers fixed @ 50mm, bend to shape including providing minimum 3mm Aluminium sheet side members for framing the louvers including fixing the louver-frame to window/ ventilator frame, providing all accessories etc. all complete, all members (louvers, louver frame, window/ventilator frame etc.) being of Aluminium and of similar electrostatically powder coating finish.	20	Kg	680	13 600
845	01AR.MF03.02	Supply, Installation, Testing and Commissioning of Horizontal Type Industrial Grade Air-Curtain with removable washable filter (warranty in the name of Owner) suitable for air-conditioned premises to be installed on the wall above Doors of desired width upto 3.0m along with necessary supporting arrangement including mounting bracket and fasteners etc., as per the following specifications: Power supply of 230 V AC, 50Hz, housing made up of durable Stainless steel (SS), Sound level not more than 68 dB when measured at 1m from source, having air discharge velocity of minimum 10 m/sec and air flow rate more than 1200m3/hr, equipped with overload protection, two speed control motor (copper winding) with operation of speed control by external switch, automatic on and off operation through photo-sensor when door is being opened and closed, Sensor (photo-sensor) supply, installation as required along with supply of 1 no. of spare sensor, removal front panel for easy installation and maintenance, including all tools, tackles, accessories, fixing at designated location above the door, etc. all complete as per specifications and instructions of the engineer-in-charge.	5	nos	35 540	1 77 700
846	01AR.MF03.03	Providing and fixing Stainless steel plate 304grade of 1.50mm thick, including writing with Embossing of letters of required size including fixing at required placed with studs, screws and rawl plugs etc. compete as per direction of engineer-in-charge.	5	sqm	16 350	81 750
847	01AR.MF03.04	Supplying and fixing of Pictogram of brush finish over steel plate depicting man/ woman in square shape of size 150 x 150 x 2mm thick (of approved make) etc. all complete as per direction of Engineer In-charge.	4	nos	2 600	10 400

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
848	01AR.MF03.05	Supply and installation of 88mm x 426mm x 2mm thick signage with L bracket indicating "WASH ROOMS" in letters and suspended from ceiling with necessary hardware etc. all complete as per the direction of Engineer In-charge.	4	nos	2 000	8 000
849	01AR.MF03.06	Supply & Fixing of manufactured factory made sandwich panel in roofing having Minimum 50mm thick Trapezoidal Noncombustible Stone wool core /Euro Class A1per EN 13501-1 having density 100 + 4 kg per cum as per IS 8183 , Melting point > 1000 degree Celsius as per ASTM E794 3, Thermal conductivity -0.040 W/mk , when tested in accordance with ASTM C518 , having U value 0.80 (W/m2K). Both side of panel elements shall be made of 0.50 mm thick steel facers with minimum yield Stress of 300 N/mm2 Coated with Aluminium - Zinc Alloy Coating AZ150 (150 gms/m2) having micro ribbed profile on both sides conforming to IS 15965:2012. The color coating should be of approved color at least 25-micron polyester coating including 5-7 micron primer in exposed surface and back coat 10-12 micron including 5-7 micron primer, with guard film for internal & external facers and further Color coated with super durable polyester (SDP) paint coat with guard Film. The external facers to have trapezoidal ribs at every 250 mm centers having rib height of 35 mm. The Internal sheet shall be microribed. Panel side laps are designed to ensure continuous insulation with complete weathertight performance achieved through anti capillary groove & sealants. Self-drilling fasteners shall be corrosion resistant plated steel with EPDM washer or Aluminum pop rivets. Size of the fasteners /rivets shall be as per design. Panels shall be engineered to provide required fastener by using appropriate flashings along with silicon sealant wherever applicable. All the operation including Structural support required to fix the panels is included in the scope and shall be completed in all respect as per drawings, Manufacturer's specifications and direction of Engineer-in-Charge.	350	sqm	3 850	13 47 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
850	01AR.MF03.07	Supply & Fixing of manufactured factory made Sandwich panel in cladding having Minimum 50mm thick Non-combustible Stone wool core /Euro Class A1 per EN 13501-1 having density 100 + 4 kg per cum as per IS 8183 , Melting point > 1000 degree Celsius as per ASTM E794 3. Thermal conductivity -0.040 W/mk , when tested in accordance with ASTM C518 having U value 0.80 (W/m2K).Both side of panel elements are made up of 0.50 mm thick steel facers with minimum yield Stress of 300 N/mm2 Coated with Aluminium - Zinc Alloy Coating AZ150 (150 gms/m2) having micro ribbed profile on both sides conforming to IS 15965:2012. Panels shall have a compressive stress of 57 kPa .Shear Stress of 27 kPa when tested in accordance with EN 12090. when tested according to EN826 The color coating should be of approved color at least 25-micron polyester coating including 5-7-micron primer in exposed surface and back coat 10-12 micron including 5-7-micron primer, with guard film for internal & external facers and further Color coated with super durable polyester (SDP) paint coat with guard Film. The external & Internal finish sheet shall be micro-ribed. Selfdrilling fasteners shall be corrosion resistant plated steel with EPDM washer or Aluminum pop rivets. Panel shall be fixed vertically fixed with tongue N groove joint. Panels shall be engineered to provide required fastener by using appropriate flashings along with silicon sealant wherever applicable. All the operation including Structural support required to fix the panels is included in the scope and shall be completed in all respect as per drawings, Manufacturer's specifications and under the overall direction of Engineer-in-Charge.	30	sqm	3 790	1 13 700

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
851	01AR.MF03.08	Providing and fixing U Baffle Aluminium panel ceiling of approved Wooden Finish MWBN colour consisting of panel size 150mm deepX50 mm width using 0.7m thick, panelling upto 4mtr,Coil Coated on a Continuous Paint Line, Double baked and roll for med from enamelled corrosion resistance Aluminium alloy AA3005(Al.Mg) for higher strength and good roll forming characteristics. Panels shall be clipped to a baked enamelled Aluminium carrier of 30 mm wide x 47mm high x 0.5mm thick, Black Colour coated, one leg of the carriers with cutouts to hold the panels in a module of 200mm.Panel carrier shall be suspended by means of threaded rod at a distance of 1.8mtr c/c. The baffle shall be manufactured on high speed, high precision roll forming machine with ARKU SIX Hi configuration roller levelling process to ensure the flatness and to avoid the failure of metal at corners which may occur normally on press brake machine. Paint Finish: Aluminium panels shall be chromatised for maximum bond between metal and paint enamelled twice under high temperature, Exposed side with a full primer and finish coat on a Continuous Paint Line. Ceiling Finish above U Baffle Ceiling: Ceiling area above U Baffle to be painted in black colour before fixing this system. The baffle ceiling system should meet the required standards for Green Pro certification and should qualify as green product as per CII green products and services council. The manufacturer should be ISO9001:2015 Quality Management System Certification compliant with in house testing facility and should have their own manufacturing plant in India. Measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.	20	sqm	8 600	1 72 000
852	01AR.MF03.09	Providing and laying tactile tile (for vision impaired persons as per standards) of size 300x300x9.8mm having with water absorption less than 0.5% and conforming to IS: 15622 of approved make in all colours and shades in for outdoor floors such as footpath, court yard, multi modals location etc., laidon 20mm thick base of cement mortar 1:4 (1cement : 4 coarse sand) in all shapes & patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction of Engineer-in-Charge.	20	sqm	2 100	42 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
853	01AR.MF03.10	Providing and laying waterproofing cum insulation system over roof consisting of: a) one coat of polyurethane primer @6-8 sq m area/ Litre over prepared roof surface, b) minimum 1.5mm DFT polyurethane water proofing coating applied by spray or brush (in minimum two layers, with scrim cloth reinforcement in between the layers) c) 40 mm thick polyurethane foam insulation applied in layers with spraying machine over the primer coat, d) minimum .8 mm DFT polyurethane water proofing coating applied by spray or brush (in minimum two layers, with scrim cloth reinforcement in between the layers) e) 150 GSM Geo textile membrane overcured Polyurethane water proofing coating f) finishing protective layer of minimum 50 mm thick PCC (1:2:4, inpanels of maximum size 2500mm x 2500mm, chequered finish, reinforced with 24 G wire netting, laid in slope), (PCC thickness more than 50 mm shall be paid extra) all including cleaning and surface preparation of the roof surface, providing 75mm radius fillets with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; 450mmx 450mm khuras (rain water collecting pits) at all outlets, testing for water leakage, scrim cloth reinforcements at junction of horizontal and vertical surfaces and also nearopenings for rainwater pipes/ outlets,continuing the waterproofing up the parapets/ walls for a minimum of 150mm over the finished roof surface, continuing into rainwater pipes by at least 100 mm etc, supply of all materials, finishing, curing etc, all complete as per job	2500	sqm	4 700	1 17 50 000
854	01AR.MF03.11	Providing & fixing at all heights and locations Letters made up of Stainless steel, grade 316 of approved make made out of laser cut shape in required design, language & font, including buffing, polishing and fixing by sufficient numbers of fasteners/ high quality chemical tape/ adhesive/fastener of approved make, all complete as per architectural drawings and direction of Engineer in charge. □ Hollow letters made of SS sheet of 1.5 mm thickness□ a)lētters with depth of 50 mm	450	per letter per cm height	250	1 12 500
855	01AR.MF03.12	Providing & fixing at all heights and locations Letters made up of Stainless steel, grade 316 of approved make made out of laser cut shape in required design, language & font, including buffing, polishing and fixing by sufficient numbers of fasteners/ high quality chemical tape/ adhesive/fastener of approved make, all complete as per architectural drawings and direction of Engineer in charge. □ Hollow letters made of SS sheet of 1.5 mm thickness□ a)lētters with depth of 75 mm	300	per letter per cm height	290	87 000

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
856	11CS	CIVIL, STRUCTURE AND ARCHITECTURE				
857	11CS.9	WOOD AND P. V. C. WORK				
858	11CS.9.121	Providing and fixing Fiber Glass Reinforced plastic (FRP) Door Frames of cross-section 90 mm x 45 mm having single rebate of 32 mm x 15 mm to receive shutter of 30 mm thickness. The laminate shall be moulded with fire resistant grade unsaturated polyester resin and chopped mat. Door frame laminate shall be 2mm thick and shall be filled with suitable wooden block in all the three legs. The frame shall be covered with fiber glass from all sides. M.S. stay shall be provided at the bottom to steady the frame.	40	metre	506	20 240
859	11CS.9.122	Providing and fixing to existing door frames.				
860	11CS.9.122.1	30 mm thick Glass Fibre Reinforced Plastic (FRP) panelled door shutter of required colour and approved brand and manufacture, made with fire - retardant grade unsaturated polyester resin, moulded to 3 mm thick FRP laminate for forming hollow rails and styles, with wooden frame and suitable blocks of seasoned wood inside at required places for fixing of fittings, cast monolithically with 5 mm thick FRP laminate for panels conforming to IS: 14856, including fixing to frames.	28	sqm	3 268	91 504
861	11CS.11	FLOORING				
862	11CS.11.47	Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS: 15622, of approved brand & manufacturer, in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS: 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).				
863	11CS.11.47.2	Size of Tile 600x600 mm	50	sqm	1 993	99 650
864	11CS.11.47.4	Size of Tile 1000x1000 mm	5	sqm	2 438	12 190
865	11CS.11.48	Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling / grouting and finishing complete as per direction of Engineer-in-charge.				
866	11CS.11.48.2	Size of Tile 600x600 mm	400	sqm	346	1 38 400
867	11CS.11.48.4	Size of Tile 1000x1000 mm	20	sqm	190	3 800

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
868	11CS.11.49	Providing and laying Vitrified tiles in floor with different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).				
869	11CS.11.49.2	Size of Tile 600x600 mm	300	sqm	1 768	5 30 400
870	11CS.11.49.4	Size of Tile 1000x1000 mm	20	sqm	2 213	44 260
871	11CS.13	FINISHING				
872	11CS.13.41	Distempering with 1st quality acrylic distemper (ready mixed) having VOC content less than 50 gram/litre, of approved manufacturer and of required shade and colour all complete to achieve even shade and colour :				
873	11CS.13.41.1	New work (two or more coats) over and including water thinnable priming coat with cement primer having VOC content less than 50 gram/litre	1725	sqm	144	2 48 400
874	11CS.13.48A	Finishing walls with ready mixed Premium acrylic emulsion paint having VOC less than 50 gm/litre and UV resistance as per IS 15489:2004, Alkali & fungal resistance, dirt resistance exterior paint of required shade (Company Depot Tinted) with silicon additives.				
875	11CS.13.48A.1	New work (Two or more coats applied @ 1.43 litre/ 10 sqm. Over and including priming coat of exterior primer applied @ 0.90 litre/10 sqm.	1725	sqm	209	3 60 525
876	11CS.13.83	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/ litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.				
877	11CS.13.83.1	One coat	100	sqm	123	12 300
878	11CS.13.83.2	Two coats	500	sqm	185	92 500
879	11CS.13.85	Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content.				
880	11CS.13.85.3	With water thinnable cement primer on wall surface having VOC content less than 50 grams/litre	500	sqm	99	49 500

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Sl. No.	ITEM NO	DESCRIPTION	QTY	UOM	RATE	AMOUNT
881	11CS.13.116	Polishing in high gloss/matt finish melamine clear polish on wood work in required color/wooden shade texture with following process in the sequence as detailed below: 1. The surface to be polished is rubbed with sand paper 80/120 no. and then with sand paper of 160/180 nos. 2. Applying two coats of sealer with spray gun and allowing sufficient drying time for 1st coat and 2nd coat is allowed to dry for 8 to 12 hrs. 3. On drying of sealer coat, wet rubbing with emery cloth of finer grading with ample water to remove excess sealer layer and make the surface further smooth after this wet rubbing, then surface is applied with special grade melamine fillers to fill all the small and big holes/grooves etc. Filler coat to be allowed to dry for 4 to 6 hrs on which again a light wet rubbing is done and this surface is further allowed to dry for 12 hrs. 4. On this, 1st coat of melamine polish is applied with spray gun using melamine clear polish and melamine thinner in required proportion. This 1st coat is allowed to dry for 24 hrs then this dry surface is again fine wet rubbed smooth, which is further allowed to dry for 12 hrs. The final melamine polish is applied with compressor pressure spray gun using melamine clear polish and melamine thinner mixed in required proportion complete as per direction of Engineer-in-Charge. (Final coat to be done in 1 or 2 layers without gap of time)	4	sqm	2 915	11 660
						22 76 54 032
						22 76 54 032

Name of Work: **MISC. BUILDING WORKS**

Bidding Document No.: **SS/B895-999-CF-T-8202/1018**

FORM SP-2

(DETAILED SCHEDULE OF RATES)

Schedule of Rates
for
Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0** Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	10 / 03 / 2026	Issued for Bidding	KECHENTHAN	SANDEEP SHARMA	GURSHARAN JEET KAUR
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01AR	ARCHITECTURE					
2	01AR.2	FLOOR FINISHING					
3	01AR.2.1	Providing and laying average 25mm cement concrete flooring in panels consisting of base course of 1:2:4 grade cement concrete (6mm down size stone aggregate) laid over sub-base of cement concrete and finishing with a layer of floating coat of neat cement slurry @ 2.75kg. of cement per Sq. M. of area including cleaning the sub-base surface, applying neat cement slurry @ 2.75 kg of cement per Sq. M. of area over the sub- base to receive the base course, compacting, tamping, trowelling, finishing, curing, providing, shuttering to the edges etc. all complete. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST .					
4	01AR.2.1.2	25mm thk. cement concrete flooring. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST .	1300	m^2			
5	01AR.2.2	Providing and laying cement concrete granolithic flooring in panels consisting of base course (under layer of 1:2:4 grade cement concrete, 6mm down size stone aggregates) laid over sub-base, wearing top- layer of cement mortar (1 cement: 3 coarse sand by volume) finished smooth by tamping, trowelling, and with a finishing floating coat of neat cement slurry @ 2.75kg. of cement per Sq. M. of area including cleaning the sub-base surface, applying neat cement slurry over the sub- base @ 2.75Kg of cement per Sq. M of area to receive the base course, compacting, tamping, trowelling, finishing, curing, providing, shuttering to the edges etc. all complete.					
6	01AR.2.2.1	With average 25mm thick under-layer and 15mm thick top layer. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	30	m^2			
7	01AR.2.3	50mm thick heavy duty flooring					
8	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	2500	m^2			

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					Figures	Words	
		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.					
9	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. □					
10	01AR.2.4.1	18mm thick. CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	250	RM			
11	01AR.2.4.3	12mm thick. CEMENT SUPPLIED BY THE CONTACTOR AT THEIR COST.	30	RM			
12	01AR.2.6	Panel dividers in flooring/dado					
13	01AR.2.6.4	P.V.C. panel dividers (3mm x 20mm size.)	800	RM			
14	01AR.2.6.5	P.V.C. panel dividers (3mm x 35mm size.)	80	RM			
15	01AR.2.10	Providing and laying machine cut chissel dressed kota stone slab of approved shade in floor tread, landing, riser, skirting, dado over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 Kg of cement per Sq.M of area to receive the mortar, providing neat cement slurry @ 4.4kg. of cement /Sq.M of area over the mortar bed, jointing each slab with neat cement paste/ grouting white cement and pigment (conforming to IS : 2114, Table-1, matching the shade of slabs), machine cutting of the slab edges square, true & plumb finishing, grinding, polishing, finishing etc. all complete.					
16	01AR.2.10.1	25mm thick kota stone slab (with tolerance +_2mm for thickness, +_2mm for length/ breadth) in floor, landing tread over average 15mm thick cement mortar 1:4(1 Cement	80	m^2			

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					Figures	Words	
		: 4 coarse sand by volume). CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.					
17	01AR.2.10.3	18mm thick kota stone slab in riser, dado, skirting over average12mm thick cement mortar1:3(1 cement:3 coarse sand by volume). CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	80	m²			
18	01AR.2.10.5	Extra for providing round nosing by machine cutting of the slab.	10	RM			
19	01AR.2.11	Providing and laying tiles in flooring , dado, skirting etc. in approved colour, design and pattern, laid over and including a coating of approved adhesive as per manufacturers specifications, flush pointing of joints of tiles with cement paste/ grouting with white cement and pigment (conforming to IS:2114, Table-1, matching the shade of tiles) finishing, cleaning etc. all complete.					
20	01AR.2.11.5	Ceramic, matt finished non-slip type tiles of approved make and shade(s) in approved design/ pattern including cleaning the finished surface with oxalic acid, wax polishing etc. for size 300mm x 300mm x 8mm (+5%) thick tiles for flooring.	80	m²			
21	01AR.2.11.6	Ceramic, matt/ glazed/ semi-glazed finished tiles of approved make & shade(s) in approved design/ pattern including cleaning the finished surface with oxalic acid, wax polishing etc. for size 300mm x 450mm x 8.5mm thick (minimum) tiles	80	m²			
22	01AR.2.15	Providing and applying pigmented (approved shade) chemical and abrasion resistant, solvent based self levelling floor coating based on epoxy resin with amine curing agents, in 2 coats @ 125 gms/sq.m. (min.)per coat by brush or spraying over a levelling screed (min. 3mm thick) of a 3 part solvent free combination of epoxy resin, amine hardeners and graded chemically inert aggregate filler, laid over a coat of 2-part epoxy resin primer applied over existing flooring etc. all as per manufacturer's specifications.	600	m²			
23	01AR.2.16	Providing and applying pigmented (approved shade) chemical and abrasion resistant,	200	m²			

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					Figures	Words	
		solvent based coating (on dado/wall) of epoxy resin with amine curing agents, in 2 coats @ 125 gms/sq.m. (min.) per coat by brush over plastering/ concrete surfaces including surface preparation, curing etc. all as per manufacturer's specification.					
24	01AR.2.17	Providing and laying minimum 18mm thick approved premium quality and shade polished granite stone slabs in flooring, counters, treads, risers, skirting, dado etc. over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement maixed with pigment (conforming to IS:2114, Table-1) to match the colour of the granite stone slabs, finishing etc. all complete.					
25	01AR.2.17.1	Granite stone slabs in flooring, counters, treads etc.(perfectly levelled) over and including a bed of cement mortar 1:4 (1 cement: 4 coarse sand by volume) CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST	150	m^2			
26	01AR.2.17.3	Granite stone slabs in risers, skirting, dado etc. over and including a bed of cement mortar 1:3 (1 cement: 3 coarse sand by volume) CEMENT SUPPLIED BY THE CONTRACTOR AT THEIR COST.	80	m^2			
27	01AR.2.17.5	Extra for round nosing/ moulded edges (as per approved design) to Granite stone slabs.□	130	RM			
28	01AR.2.21	Providing and laying anti slip (rough)Granite stone slabs, of thickness minimum 25mm, in flooring, landing, tread, ramps over minimum 20mm thick cement mortor1:4 (1 cement :4 course sand by volume) over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement mixed with pigment (conforming to IS:2114, Table-1) to match the colour of the granite stone slabs, finishing etc. all complete.					

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					Figures	Words	
29	01AR.2.21.01	Cement supplied by the Contractor at there cost	70	m²			
30	01AR.2.22	Providing and fixing approved design and shade heavy duty 10mm thick 300mm x 300mm Exterior grade vitrified tiles (of ¿pavgres¿ series of ¿Kajaria¿ or approved equivalent) over and including a bed of cement mortar including preparing the base surface, applying neat cement slurry @ 2.75 kg. of cement per sq. mtr. of area to receive the mortar bed, jointing each slab with neat cement paste/ grout with white cement mixed with pigment (conforming to IS:2114, Table-1)					
31	01AR.2.22.1	Cement supplied by the Contractor at there cost	10	m²			
32	01AR.2.23	Providing 3 nos. of 3mm grooves at spacing of 30mm in Kota/ Marble/ granite stone laid in stairs¿ treads/ landings all complete as per the direction of Engineer-In-Charge. (Single measurement shall be considered for 3 parallel grooves)	450	RM			
33	01AR.3	WOOD WORK					
34	01AR.3.1	Wooden frames of doors, windows, ventilators Providing and fixing wooden frames of doors, windows, ventilators including cutting, shaping, jointing, applying a coat of bituminous paint on concealed surface, wood primer on exposed surface, fixing in masonry/RCC by means of 300mm x 25mm x 6mm thick M.S. hold fasts screwed to frame @ 600mm max vertically and grouted with M-15 grade concrete in min. 350mm x 100mm x 100mm sized hole made in masonry/96mm long, 12mm dia M.S. dash fastener, painting with two coats of approved shade and make (ICI or equivalent) synthetic enamel paint over approved quality primer coat, finishing etc. all complete.					
35	01AR.3.1.1	Wooden frames with second class teak wood conforming to IS : 4021.	0.2	m³			
36	01AR.3.2	35mm thick block board flush shutter					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		Providing and fixing Factory made, overall 35mm thick block board flush shutter consisting of solid core block board bonded with phenol phormaldehyde synthetic resin conforming to IS : 848 and faced on both faces with commercial type plywood/teakwood veneering/ lamination bonded with phenol formaldehyde synthetic resin conforming to IS : 848, including providing and fixing second class teakwood perimeter beading fixed by means of approved quality neoprene based adhesive and nailing @ 300 mm max.. painting exposed surface with two coats of approved shade and make synthetic enamel paint over approved quality primer coat, providing and fixing 125mm long M.S. butt hinges [for each shutter (vertical spacing not exceeding 600mm)] including fixing with door frame, finishing etc. all conforming to IS : 2202.					
37	01AR.3.2.3	Door shutter faced with 1mm thick approved quality lamination of approved shade/brand.	6	m^2			
38	01AR.3.7	Providing and fixing in position following items including all necessary fixtures, fittings, finishing etc. all complete.					
39	01AR.3.7.1	Approved make heavy duty overhead hydraulic door closer with adjustable spanners, metal screws etc. conforming to IS : 3564	35	nos			
40	01AR.3.7.4	Approved make heavy duty hydraulically operated, adjustable floor mounted door closer conforming to IS:6315, Double action type.	15	nos			
41	01AR.3.7.6	Approved make pressure die cast zinc alloy, chromium plated door handle. 300 mm long.	25	nos			
42	01AR.3.7.7	Approved make pressure die cast zinc alloy, chromium plated door handle. 600mm long.	10	nos			
43	01AR.3.7.8	Approved quality 3mm thick plastic kick/push plate fixed with brass screws.	8	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
44	01AR.3.7.9	Approved quality anodized aluminium aldrop 300mm long, 19.05mm dia in bronze colour.	18	nos			
45	01AR.3.7.10	Approved quality anodized aluminium tower bolts conforming to IS-204 in Bronze colour, 250 x 10mm.	10	nos			
46	01AR.3.7.11	Approved quality anodized aluminium tower bolts conforming to IS-204 in Bronze colour, 150 x 10mm.	25	nos			
47	01AR.3.7.12	Approved quality zinc alloy pressure die cast, chromium plated spring loaded round door stopper with double heavy duty rubber shoes.	20	nos			
48	01AR.3.7.13	Approved quality 75mm long aluminium toilet door latch with vacant/occupied indicator.	8	nos			
49	01AR.3.7.14	Approved quality chromium plated brass coat and hat hook fixed with chromium plated brass screws.	8	nos			
50	01AR.3.8	Providing and fixing minimum 12mm thick X 50mm wide teak wood Architrave (moulding) of approved design along frames etc. including lacquer polishing/ painting matching with adjoining wood work.	8	m			
51	01AR.4	STEEL/AL./GLAZED/FULLY GLASS/PVC DOORS,WINDOWS & VENTILATORS					
52	01AR.4.5	S/F M.S. rolling shutters Supplying and fixing M.S. rolling shutters, conforming to IS : 6248 including providing all accessories like shutter (constructed with inter locking lath sections formed out of cold rolled steel strips 0.9mm thick, 80mm wide and 1.25mm thick, 80mm wide respectively for shutter width upto 3.5M and above 3.5M), jointless M.S. channel section for guide (min. 3.15mm thick), M.S. girders, pressed bottom rails, shutter					

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Page 1030 of 2811 : B895-TENDER DOC-B895-999-81-46-CF-T-8202 : Rev. A

S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		suspension stud shaft with pully and cage, top rolling springs, locking arrangement etc. as per approved manufacturers drawings including painting with two coats approved make & shade and synthetic enamel paint over a coat of approved quality red oxide zinc chromate primer, making good of all damaged surfaces etc. all complete.					
53	01AR.4.5.9	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width upto 3.5 metre with all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	50	m^2			
54	01AR.4.5.10	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width beyond 3.5 metre with all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	80	m^2			
55	01AR.4.5.11	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width upto 3.5 metre with MS grill (in place of interlocked lath sections), all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	8	m^2			
56	01AR.4.5.12	Motor operated rolling shutter as per approved Manufacturer's design & drawing for rolling shutters for width beyond 3.5 metre with MS grill (in place of interlocked lath sections), all necessary electricals like motor, switching panels, switches, cables, wires etc. as required for smooth functioning of the shutter	5	m^2			
57	01AR.4.9	Fully Glass Door Providing and fixing frameless single piece Glass Doors (swing shutter) in partition made of 12mm thick toughened float glass (MODIGUARD or equivalent) single shutter with stainless steel finish patch fittings (DORMA or approved equivalent)and 150mm x	7	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		44mm extruded Aluminium frame at bottom , including all hardware such as SS patch fittings, floor spring, pivot on top, locking arrangement (EVERITE or approved equivalent make), 30mm dia, 350mm long SS pull handle (DORMA or approved equivalent make) etc. all complete.					
58	01AR.4.10	Etching Film on Glass Providing & applying translucent cast vinyl self adhesive washable type film with sandblasting effect (of '3M(TM) Scotchcal(TM) Frosted Crystal 7725-324' or approved equivalent) and of approved graphic design (electronic/ computer plotted & cut) having durability of 10-15 years, over glass surface in doors/ windows/ partitions etc. including preparation of base surface, cleaning, finishing etc. all complete.	24	m^2			
59	01AR.4.12	Pressed steel sheet door shutter Providing and fixing pressed steel sheet door shutter made of 18 SWG galvanized pressed steel sheet bent to form hollow box of 40 mm overall thickness; and consisting of/ including: (i) 3 mm thick MS flat all along perimeter (ii) Packing the shutter with mineral wool (48 kg/cum) without gap (iii) Strengthening with 18 SWG GI vertical stiffeners @200 c/c (iv) 3 mm thick MS pad plates welded inside at required locations for fixing of hardware etc. (v) Fixing to door frame by 100 mm long SS 304 grade heavy duty ball bearing hinge @600 c/c maximum (vi) Hardware and vision panel as required. (vii) Grinding and smoothening of welding, cleaning, finishing (synthetic enamel painting/ polyurethane (PU) coating/ electrostatic powder coating), making true alignments and surfaces etc. all complete. Notes: 1. Reference shall be made to EIL standard nos. 7-75-0070, 7-75-0071 Only the net shutter(s) area shall be measured for payment					
60	01AR.4.12.3	Single shutter painted with Electrostatic powder coating with following hardware:	13	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		(i) Over head hydraulic door closer (heavy duty). (ii) SS 304 grade 16 mm dia 250mm long aldrop on both sides of shutter. (iii) Spring loaded heavy duty door stopper (iv) SS 304 grade 19 mm dia.200 mm long handle on both side of shutter. (v) 10 mm dia SS 304 tower bolt (250mm long for 2100mm height & 600mm long for 2500mm height)					
61	01AR.4.12.6	Double shutter painted with Electrostatic powder coating with following hardware: (i) Over head hydraulic door closer (heavy duty). (ii) SS 304 grade 16 mm dia 300mm long aldrop on both sides of shutter. (iii) Spring loaded heavy duty door stopper. (iv) SS 304 grade 19 mm dia.200 mm long handle on both side of shutter. (v) 10 mm dia SS 304 tower bolt (250mm long for 2100mm height & 600mm long for 2500mm height) (vi) 2mm thick 25mmx 25mm GI angles (vertical) welded to each shutter at the meeting point of double shutter.	45	m^2			
62	01AR.4.14	Aluminium work for doors, windows, ventilators and partition Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) :					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
63	01AR.4.14.2	For fixed portion of aluminium doors, windows, ventilators and partitions made from Powder coated aluminium (minimum thickness of powder coating 50 micron)	350	kg			
64	01AR.4.14.5	For shutters of doors, windows & ventilators made from Powder coated aluminium (minimum thickness of powder coating 50 micron) including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber / neoprene gasket required (Fittings shall be paid for separately)	750	kg			
65	01AR.4.14.13	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and brass cover plate of minimum thickness 1.25 mm with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge.	12	each			
66	01AR.4.14.15	Providing and fixing machine moulded aluminium covering of approved pattern & design, made out of machine cut Powder coated aluminium sheet, 2.5mm thick (minimum thickness of powder coating 50 micron) and machine holed for receiving dash fastener, over expansion joints on vertical surfaces/ceiling floors, the fixing on plate in one row on one side of joint only shall be done with stainless steel dash fasteners of 8 mm dia and 75 mm long bolt including providing aluminium washers 2 mm thick & 15 mm dia , at a staggered pitch of 200mm centre to centre including drilling holes in the receiving surface and providing expandable plastic sleeves in holes etc. complete as per direction of Engineer-in-charge.	380	kg			
67	01AR.4.14.16	Filling gaps of size upto 5mm depth and 5 mm width in between aluminium frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod	180	m			

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					Figures	Words	
		of approved quality as per architectural drawings and direction of Engineer-in-charge complete					
68	01AR.4.14.18	Providing and fixing 255 X 19 mm adjustable friction window stays of approved quality made from Stainless Steel (SS 304 grade) with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-charge complete.	90	each			
69	01AR.4.14.19	Providing and fixing 355 X 19 mm adjustable friction window stays of approved quality made from Stainless Steel (SS 304 grade) with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-charge complete.	90	each			
70	01AR.4.14.23	Providing and fixing Powder coated aluminium (minimum thickness of powder coating - 50 micron) tubular handle bar 32 mm outer dia, 3.0 mm thick & 2100 mm long with SS screws etc complete as per direction of Engineer-in-Charge.	90	each			
71	01AR.4.14.25	Providing and fixing 100mm brass locks (best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	10	each			
72	01AR.4.14.27	Providing and fixing Powder coated minimum thickness 50 micron aluminium round shape handle of outer dia 100 mm with SS screws etc. complete as per direction of Engineer in-charge	10	each			
73	01AR.4.14.29	Providing and fixing 100 mm long aluminium handles, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete	14	nos			
74	01AR.4.14.30	Providing and fixing aluminium tower bolts of size 100mm x 10mm , ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete	110	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
75	01AR.4.14.31	Providing and fixing toughened glass panes of 6.0 mm thickness in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item)	200	m^2			
76	01AR.4.14.32	Providing and fixing laminated glass panes of 6.3 mm thickness in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item)	7	m^2			
77	01AR.4.14.33	Double insulated toughened glass Providing and fixing in aluminium door, window, ventilator shutters and partitions etc. 24mm thick hermetically sealed double insulated toughened glass (6mm high performance toughened glass on outside with reflective soft coating on surface of blue green shade + 12mm dry air gap by a metal spacer filled with dehydrating agent inside the unit to prevent moisture formation between the two panes +6 mm thick clear toughened glass on inside) Glass type -GT3 performance characteristic shall be as given below or better than: (i) Light transmission : 40%-50% (ii) External Reflection : 10-20% (iii) Internal Reflection : 15%-20% (iv) Shading coefficient : <0.28 (v) Solar Factor : <=0.25 (vi) U Value : 1.5 to 1.8 W/m2 degree K with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item). The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement. The glass shall be of SKN/KT series of Saint Gobain make (ECBC Compliant) or approved equivalent	6	m^2			
78	01AR.4.14.35	Providing and fixing in position decorative Powder Coated Aluminium grill (minimum	60	kg			

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		thickness of powder coating 50 micron), made of approx. 7.5 mm wide, 6mm thick sections with gapping of approx. 85 mm x 70mm maximum of approved design, pattern and make fixed to the outer frame or shutter frame of door/ window/ ventilator with C.P brass/ stainless steel screws @ 200mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved powder coated aluminium standard section around the opening, all complete as per requirement and direction of Engineer-incharge.					
79	01AR.4.15	P/F pressed steel door and window frames Providing and fixing pressed steel door and window frames of size (assorted size out of) Overall 125mm x 60mm section, of required profile conforming to IS: 4351, made of 16 SWG pressed steel including/ consisting of: i)3 mm thick MS flat spacers welded to frame @ 500mm c/c and at holdfast locations. ii)Filling the hollow frame section with concrete. iii)MS angle (20mmx20mmx3mm) horizontal tie member below floor finish. iv)MS holdfasts (200mmx25mmx6mm) welded to spacers. v)Fixing to masonry (by grouting the holdfasts with M-15 grade concrete in minimum 250mm x 100mm x 100mm sized hole)/ fixing to RCC (by minimum 100mm long, 12 mm dia metallic counter sunk anchor fasteners) vi)MS pad plates (40mm x 150mm x 3mm) & GI mortar guard welded to frame at hinge and other hardware locations. vii)Metering of joints between horizontal and vertical members, grinding and smoothening of welding, cleaning of frame surface, finishing (synthetic enamel painting/ electrostatic powder coating/ polyurethane (PU) coating), making true alignments and surfaces etc. all complete. Notes: 1)Reference shall be made to EIL standard nos. 7-75- 0070, 7-75-0071 2)Cumulative length of all horizontal and vertical frame members shall be measured for payment.					
80	01AR.4.15.5	Frames painted with Electrostatic Powder coating.	110	m			

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					Figures	Words	
81	01AR.4.15.6	Extra for box type transoms & mullions	15	m			
82	01AR.4.16	P/F Gypsum Board/ Calcium silicate board Partitions Providing and fixing partition upto ceiling height consisting of G.I. frame and required board, including providing and fixing of frame work made of special section power pressed/ roll form G.I. sheet with zinc coating of 120 gms/sqm(both side inclusive), consisting of floor and ceiling channel 50mm wide having equal flanges of 32 mm and 0.50 mm thick, fixed to the floor and ceiling at the spacing of 610 mm centre to centre with dash fastener of 12.5 mm dia meter 50 mm length or suitable anchor fastener or metal screws with nylon plugs and the studs 48 mm wide having one flange of 34 mm and other flange 36 mm and 0.50 mm thick fixed vertically within flanges of floor and ceiling channel and placed at a spacing of 610 mm centre to centre by 6 mm dia bolts and nuts, including fixing of studs along both ends of partition fixed flush to wall with suitable anchor fastener or metal screws with nylon plugs at spacing of 450 mm centre to centre, and fixing of boards to both side of frame work by 25 mm long dry wall screws on studs, floor and ceiling channels at the spacing of 300 mm centre to centre. The boards are to be fixed to the frame work with joints staggered to avoid through cracks, M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5 mm each) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corners (25 mm x 25 mm x 0.5 mm), joint finisher and two coats of primer suitable for board as per manufacture¿s specification and direction of engineer in charge all complete.					
83	01AR.4.16.1	75 mm overall thickness partition with 12.5 mm thick double skin fire rated board conforming to IS: 2095: part I	7	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
84	01AR.4.16.2	75mm overall thickness partition with 12.5 mm thick double skin tapered edged plain Gypsum board conforming to IS: 2095: part I	8	m²			
85	01AR.5	PLASTERING & POINTING					
86	01AR.5.1	Providing plain cement plaster in cement mortar (1 cement:4/6 fine sand by volume) on masonry, PCC/ RCC including preperation of base, finishing, curing etc; also including providing 20 gauge chicken wire mesh stretched tight at all RCC/ PCC and masonry meeting points in 300mm wide strips (150mm on on each surface) fixed with G.I. "U" type nails before plastering.					
87	01AR.5.1.13	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 18mm thick 1:6 (1 cement : 6 sand) Cement supplied by the Contractor at their cost.	2500	m²			
88	01AR.5.1.15	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 15mm thick 1:4 (1 cement : 4 sand) Cement supplied by the Contractor at their cost.	2000	m²			
89	01AR.5.1.17	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight, Average 12mm thick 1:4 (1 cement : 4 sand) Cement supplied by the Contractor at their cost.	3000	m²			
90	01AR.5.1.19	Plain cement plaster with waterproofing compound conforming to IS-2645 (CICO/ approved equivalent) mixed to cement mortar @ 3% by weight. Average 6mm thick 1:4 (1 cement : 4 sand) Average 6mm thick 1:4 (1 cement : 4 sand). Cement supplied by the Contractor at their cost. □	2400	m²			
91	01AR.5.4	Providing 20mm x 10mm Grooves in plastering in perfect straight line, plumb and uniform size throughout including finishing etc. all complete.	1700	RM			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
92	01AR.5.7	Providing and applying 12 mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part - 1 & II) 1976, applied on hacked / uneven background such as bare brick/ block/ RCC work on walls & ceiling at all floors and locations, finished in smooth line and level etc. complete.	35	sqm			
93	01AR.6	ROOFING TREATMENT					
94	01AR.6.2	PCC 1:2:4 over concrete surfaces Providing and laying cement concrete (1 cement : 2 coarse sand : 4 aggregate) over concrete surfaces, laid to slope at all heights including, finishing, curing, tamping etc. all □					
95	01AR.6.2.1	Cement supplied by the Contractor at their cost.	70	m^3			
96	01AR.6.6	Cinder Concrete (1:10) Providing and laying Cinder Concrete (1 cement : 10 cinder of 48mm size and down grade) in all sunk areas finished with 12mm thick plain cement plaster (1 cement : 6 coarse sand by volume) including consolidating, finishing, curing, maintaining slope etc. all complete. □					
97	01AR.6.6.1	Cement supplied by the contractor at their cost	6	m^3			
98	01AR.6.10	P/L one component PU elastomeric membrane roof treatment Providing and laying one component urethane polymers based elastomeric membrane roof treatment/ waterproofing-cum-terracing system consisting of one or more coats of urethane based high solid content elastomeric membrane (having high viscosity to					

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					Figures	Words	
		give a high build film) at approx. coverage of 0.5 kg per sq.M each coat applied over and including a coat of urethane primer EMP (cured to a slightly tacky film) at a coverage of 8 Sq.M per litre by brush applied to achieve overall thickness of 1.5 mm (+ or - 15%) as per ASTM C-836/898 over all exposed roof surfaces, continued up the parapets/ walls for a minimum of 150mm over the finished roof surface, continued into rain water pipes by at least 100mm; including the preparation of the surface which shall include thorough cleaning of roof surface with a wire brush and removal of all foreign matter etc.; well defined cracks on the surface cut to ""V"" section, cleaned and filled up with a suitable mastic; sprinkling of 300 micron layer of clean sand over the final coat of PU when tacky; providing finishing protective layer of 50 mm thk. P.C.C. (1:2:4) in panels of maximum size 1200mm x 1200mm chequered finish with 24 SWG chicken wiremesh interposed in between finished smooth with joints between panels sealed with suitable urethane based elastomeric compound as per manufacturer's specifications; providing fillets of 75 mm radius with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; providing 450mm x 450mm khuras (rain water collecting pits) in 1:2:4 cement concrete at all outlets, levelled down by min. 25mm, finishing, curing etc. all complete as per approved manufacturer's standard specifications and recommendations.					
99	01AR.6.10.1	Cement supplied by the contractor at their cost	40	m^2			
100	01AR.6.12	P/L A.P.P. modified reinforced bituminous memb. waterproofing Providing and laying 4mm thick A.P.P (atactic polypropelene) modified reinforced bituminous waterproofing membrane over terrace and parapet including cleaning and preperation of the surface consisting of making good all the cracks and damages, filling potholes/ depressions, removing weak foam concrete/ plaster and refilling with same wherever required thus preparing smooth surface of the terrace; providing and applying one coat of cold applied bitumen based primer @ 0.2 to 0.4 litre per sq. mtr.; laying the membrane by torch welding over primer, providing 100mm overlaps and					

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					Figures	Words	
		appropriately pressing the membrane to remove any entrapped air, including fixing on parapet after providing 10mm x 20mm continuous groove in parapet for terminating the membrane and filling the groove with polyurethane sealant and continuing this treatment at rain water outlet points; providing finishing protective layer of 35 mm thk. P.C.C. (1:2:4) in panels of maximum size 1200mm x 1200mm chequered finish with 24 SWG chicken wiremesh interposed in between finished smooth with joints between panels sealed with suitable polyurethane sealant; providing fillets of 75 mm radius with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; providing 450mm x 450mm khuras (rain water collecting pits) in 1:2:4 cement concrete at all outlets, levelled down by min. 25mm, finishing, curing etc. all complete as per approved manufacturer's standard specifications and recommendations.					
101	01AR.6.12.1	Cement supplied by the contractor at their cost	1200	m^2			
102	01AR.7	WHITEWASHING, PAINTING & POLISHING					
103	01AR.7.9	Providing and applying textured wall coating system consisting of twin pack fine grade silica granules/ dry flakes made of special grade of china clay/ granite type flakes of `Heritage' or equivalent in approved shade and texture; mixed in-situ with 100% acrylic polymer bonding agent; applied over plastered surfaces; the granules/ flakes etc., bonding material, mixing, method of application surface preperation etc. all shall be as per manufacturer's recommendations and specifications.					
104	01AR.7.9.1	Providing and applying textured granular type wall coating.	80	m^2			
105	01AR.7.10	Providing and applying min 2 mm thick white cement and polymer based wall putty (JK Wall care/ Birla Putty/ SARA or approved equivalent) over plastered surfaces (masonry wall/ RCC) and smoothening the surface with sand paper etc., preparation of surface etc. all complete as per the approved manufacturer's recommendations and directions of Engineer-in-charge.	14000	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
106	01AR.8	ROOFING					
107	01AR.8.10	Providing and fixing 40mm x 6mm M.S. flat wind ties over sheeting with anticorrosive polymer coated G.I. nuts, bolts, polymer cap, seal and thrust washers of approved make iincluding painting with two coats of synthetic enamel paint of approved make over a coat of approved quality red oxide zinc chromate primer etc.all complete.	350	RM			
108	01AR.8.12	Providing and fixing rain water pipes with M.S. holder clamps including fixing/embedding into masonry/concrete, providing connections like shoes, vents, specials, bends etc. fixing in perfect plumb etc. all complete.					
109	01AR.8.12.5	110mm dia O.D. Size. exposed PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	18	RM			
110	01AR.8.12.6	160mm dia O.D. Size. exposed PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	700	RM			
111	01AR.8.12.7	110mm dia O.D. Size. embedded PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details.	18	RM			
112	01AR.8.12.8	160mm dia O.D. Size. embedded PVC rain water pipe jointed with bonding solution of approved quality and make with pressure rating of 4kg/cm2 including clamps, connections etc. all as per approved manufacturer's details	18	RM			
113	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	3450	m^2			

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					Figures	Words	
		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.					
114	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.	1350	m^2			
115	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	380	m^2			

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					Figures	Words	
		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.					
116	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.					
117	01AR.8.24.1	approx. size 700 mm outer dia. with minimum 2500 CFM capacity	3	nos			
118	01AR.9	SANITARY FITTINGS & FIXTURES					
119	01AR.9.1	Providing and fixing white glazed Earthenware Orissa pan type water closet with integral footrest of 550mmx440mm size conforming to IS : 2556, Part - III including glazed earthenware flushing cistern supported on MS brackets conforming to IS:774 of 10 litre capacity with CP brass handles,32mm dia telescopic flush pipe with fittings & clamps,15 mm dia overflow pipe with mosquitoproof net,15mm dia PVC connection pipe 450mm long,painting of all exposed metalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved qualityred oxide zinc chromate, cutting walls, floors and making good of same,finishing, soldered joints, making inlet/ outlet connections,providing min. 150mm thick sand cushion, finishing etc. all complete.	1	nos			
120	01AR.9.2	Providing and fixing white glazed Earthen ware double trap, syphonic pattern wash down water closet conforming to IS : 2556 Part II including white plastic solid seat and cover conforming to IS : 2548, CP brass hinges and rubber buffers,10 litres capacity glazed Earthenware low level cistern conforming to IS:774 with internal overflow system & fittings,CP brass 40mm dia flush pipe,15 mm dia ,450mm long PVC	6	nos			

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					Figures	Words	
		connection pipe,ball valve, painting of all exposed matalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, cutting walls, floors and making good of same, making inlet and outlet connections, finishing etc. all complete.					
121	01AR.9.3	Providing and fixing white glazed ceramic, flat back half stall type Urinals of 610mm x 400mm x 380mm size conforming to IS:2556 Part-VI including automatic glazed Earthenware cistern for every one 15mm dia CP brass cistern outlet 750mm long,32mm dia GI waste pipe with brass union,CP brass bottle trap,CP brass spreader,tee,distribution pipe etc.,MS brackets for cistern, painting of all exposed mettalic surface with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, making inlet and outlet connections, fixing with C.P. brass screws, finishing etc. all complete.					
122	01AR.9.3.1	One urinal.(with 5 litre capacity cistern)	3	nos			
123	01AR.9.6	Kitchen Sink					
124	01AR.9.6.1	Providing and fixing white glazed vitrous china Lab sink/kitchen sink of 610mm x 450mm x 250mm size conforming to IS : 2556, Part-V including approved M.S./C.I. brackets conforming to IS : 775, one 15mm dia CP brass bibcock, 15mm dia PVC conection, C.P. brass chain with 40mm dia GI pipe connected to floor trap with unions, painting all exposed metallic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate,cutting floor,Walls and making goodgood the same, making all connections, finishing etc. all complete.	3	nos			
125	01AR.9.8	Glass Shelf					
126	01AR.9.8.1	Providing and fixing 600mm x 120mm x 4mm thick Glass shelf of approved quality with CP brass bracket and guard rails including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc.all complete.	4	nos			

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					Figures	Words	
127	01AR.9.9	Towel Rail					
128	01AR.9.9.1	Providing and fixing approved quality chromium plated brass towel rail of 20mm dia, 600mm length and 1.25mm thickness including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	4	nos			
129	01AR.9.10	Soap Container					
130	01AR.9.10.1	Providing and fixing approved quality chromium plated liquid soap container including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same,finishing etc. all complete.	5	nos			
131	01AR.9.11	Providing and fixing Heavy grade Bib cocks/ stop cocks of spring loaded self closing type conforming to IS : 781 including making connections, cutting walls and making good the same etc. all complete.					
132	01AR.9.11.1	15mm dia CP Brass stop cock.	13	nos			
133	01AR.9.11.2	15mm dia CP Brass bib cock.	8	nos			
134	01AR.9.13	Providing and fixing CP brass shower rose conforming to IS-2064:					
135	01AR.9.13.2	150mm dia shower rose.	1	nos			
136	01AR.9.14	Toilet Paper Holder					
137	01AR.9.14.1	Providing and fixing CP Brass Toilet paper holder of approved make with CP brass brackets including fixing to wall with wooden cleats, CP brass screws,cutting walls and making good the same, finishing etc. all complete.	7	nos			
138	01AR.9.15	Providing and fixing in position round/ oval shaped counter Hand Wash Basin with anti-splash rims, conforming to IS:2556 Part IV, to fit in exactly and neatly in the cutout in the marble/ granite stone finished R.C.C counter; one 15mm dia CP brass pillar cock, rubber plug with C.P. brass chain, 32mm C.P. waste fitting of standard pattern type with 32mm dia G.I. pipe, C.P. brass bottle trap, cutting walls, counter etc. and making good the same, also including providing cut out in marble/ granite slab counter top (and R.C.C underneath) of exact size and shape for wash basin to fit in neatly and perfectly; making all connections, finishing etc. all complete. (Marble/					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		Granite counter top shall be paid seperately under relevant item of `Floor Finishing')					
139	01AR.9.15.2	Providing round/ oval shaped counter Wash Basin of glazed chinaware in approved colour.	5	nos			
140	01AR.9.16	Stainless steel Kitchen/ Laboratory sink					
141	01AR.9.16.1	Providing and fixing stainless steel Kitchen/ Laboratory sink of approx. Size 610mm x 450mm x 200mm made of min. 1mm thick stainless steel sheet of `Salem Steel' or equivalent supported on and including M.S. brackets conforming to IS: 775; one 15mm dia C.P brass long body bib cock (if fixed to wall) or swivel type pillar cock (if fixed to counter), 15mm dia PVC/ G.I. connections to floor trap with unions etc.; painting all exposed metallic surfaces with min. 2 coats of synthetic enamel paint of approved make and shade over acoat of red oxide zinc chromate primer; cutting floor, walls, counter etc. and making good the same, making all connections, finishing etc. all complete.	5	nos			
142	01AR.9.17	17mm thick polished granite stone partitions					
143	01AR.9.17.1	Providing and fixing minimum 17mm thick polished granite stone partitions (in approved quality, shade and design/ shape) with round edges for urinals including cutting walls, inserting (up to 100mm depth) and fixing the slab with Cement Mortar (1 cement : 3 coarse sand by volume), making good of all damaged work, finishing etc. all complete	5	m^2			
144	01AR.9.18	round edged mirror of 6mm thick					
145	01AR.9.18.1	Providing and fixing round edged mirror of 6mm thick float glass with 6mm thick waterproof marine ply backing and rounded/ beveled edging, fixed on wall with wooden cleats and CP brass screws including cutting walls/ tiles, making good the same, finishing etc. all complete.	7	m^2			
146	01AR.9.19	CP Brass hand shower					
147	01AR.9.19.1	Providing and fixing CP Brass hand shower (health Faucet, of Jaquar or approved equivalent) with 8 mm Dia, 1 metre long PVC Tube and Wall hook in approved colour and finish with all necessary fittings etc. all complete.	7	nos			
148	01AR.9.20	chromium plated brass towel ring					

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					Figures	Words	
149	01AR.9.20.1	Providing and fixing approved quality chromium plated brass towel ring of 150mm dia including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	7	nos			
150	01AR.9.21	chromium plated brass towel rack					
151	01AR.9.21.1	Providing and fixing approved quality chromium plated brass towel rack with towel rail, of 250mm width and 600mm length including fixing to wall with wooden cleats and CP brass screws, cutting walls and making good the same, finishing etc. all complete.	3	nos			
152	01AR.9.23	white glazed Earthen ware double trap, syphonic pattern wall mounted (European type) wc					
153	01AR.9.23.1	"Providing and fixing white glazed Earthen ware double trap, syphonic pattern wall mounted (European type) water closet conforming to IS: 2556 Part 16 including white plastic solid seat and cover conforming to IS : 2548, CP brass hinges and rubber buffers, CP brass 40mm dia flush pipe,15 mm dia, ball valve, painting of all exposed metalic surfaces with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, cutting walls, floors and making good of same, making inlet and outlet connections, finishing etc. all complete.	5	nos			
154	01AR.9.24	white glazed ceramic, flat back half stall type Urinals sensor based					
155	01AR.9.24.1	"Providing and fixing white glazed ceramic, flat back half stall type Urinals of 610mm x 400mm x 380mm size conforming to IS:2556 Part-VI, having electronic, battery operated sensor based flushing system of approved make and model including 32mm dia GI waste pipe with brass union, CP brass bottle trap, CP brass spreader, tee, distribution pipe etc., painting of all exposed metallic surface with 2 coats of approved shade and quality synthetic enamel paint (ICI or approved equivalent) over a priming coat of approved quality red oxide zinc chromate, making inlet and outlet connections, fixing with C.P. brass screws, finishing etc. all complete.	5	nos			
156	01AR.9.25	C.P. brass 2 way bib cock quarter turn type for health faucet					

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					Figures	Words	
157	01AR.9.25.1	Providing, fixing, testing and commissioning C.P. brass 2 way bib cock quarter turn type for health faucet of approved make or equivalent 15 mm nominal bore, all complete as per standard design, specifications and direction of Engineer-in-charge.	3	nos			
158	01AR.9.26	C.P. brass wall mount Lavatory faucet mixer for wash basin					
159	01AR.9.26.1	Providing, fixing, testing and commissioning C.P. brass wall mount Lavatory faucet mixer for wash basin of following make or approved equivalent 15 mm nominal bore, all complete as per standard design, specifications and direction of Engineer-in-charge.	5	nos			
160	01AR.9.27	Glass shelf					
161	01AR.9.27.1	"Providing and fixing 600mm x 120mm x 6mm thick Glass shelf of approved quality with 'D' or 'F' bracket (Stainless Steel 202 grade) and guard rails including fixing to wall with plastic rawl plugs and SS screws, drilling walls and making good the same, finishing etc., all complete.	5	nos			
162	01AR.9.28	Providing and Fixing Concealed Flushing Cistern Size 550X95X500mm with dual flush Actuator, flush-stop function, noise less float valve and fast filling action with all component parts of high quality complete including frame for concealed cistern etc. all complete as per the instructions of the engineer-incharge.	5	nos			
163	01AR.9.29	Providing and Fixing of Flushing plate with dual knobs chrome Finish in desired shape and size for Concealed Flushing Cistern including all tools, tackles etc., all complete as per the instructions of engineer-in-charge.	5	nos			
164	01AR.10	FALSE CEILING, FALSE FLOORING, UNDERDECK INSULATION, PARTITIONING					
165	01AR.10.1	Providing and fixing False Ceiling grid framework for supporting ceiling tiles consisting of main and cross runners supported from roof slab at desired height in desired pattern including finishing, making the frame work perfectly levelled and aligned etc. all complete.					
166	01AR.10.1.1	Anodised (25 micron) aluminium grid framework consisting of extruded anodized aluminium (2.50mm thick) main runners (`T'shaped, 25mm x 35mm size), cross runners (`T'shaped 25mm x 25mm size),Wall angles including suspending the main	650	m^2			

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		runners @ 600mm c/c max, by means of 6mm dia M.S. hooks slotted in 25mm x 25mmx3mm thick M.S. angle fixed to roof slab with dash fasteners and connected to 3mm thick M.S. clamp (connected to main runners with 25mm long M.S. Nut) with levelling nut @ 1200mm c/c max. assembling the main and cross runners by means of aluminium angle cleats inter locking each other to forn the grid work of 600mm of 600mm size (max) fixing the aluminium wall angles with dash fastners etc. all complete.					
167	01AR.10.3	Providing and fixing Mineral Fibre Tile false ceiling consisting of A. 600mm x 600mm x 15mm thick Mineral Fibre Acoustical tiles with durable tegular edging having noise reduction coefficient (NRC) value of min. 0.50, light reflectance value of min. 80%,thermal conductivity (K) value of 0.052-0.057 w/m deg.C and fire performance conforming to class-I as per BS-476,back of the tiles being provided with one coat of protective coating. B. Suspension system consisting of hot dipped galvanised steel main runners @ max. 1200mm c/c (0.33mm thk.,"T"shaped, 24mm x 38mm size with single rotary stiching), cross runners (0.25mm thk.,"T" shaped with double rotary stiching, 24mm x 30mm size, 1200mm long and 24mm x 25mm size, 600mm long), perimeter sections (0.45mm thick,22mm x 22mm size) including suspending the system by means of 4mm dia MS wire,6mm thk. MS cleat of 25mm x 25mm size, dash fasteners and level adjustors, providing 30 micron powder coating to exposed metallic members, providing slit openings for fixing supply/return air grill, lighting fixtures, AC ducts etc. all complete.					
168	01AR.10.3.2	With fine granulated surface tiles (Acoustical punchers (10mm deep) = 24000sm)	1000	m^2			
169	01AR.10.7	Providing and fixing partition/ panelling boards over MS framework as per desired pattern including providing cut-outs for fixing wall fixtures, conduits etc. all complete.					
170	01AR.10.7.3	12.5mm thick Gypsum board panels in partition (conforming to IS : 2095, having thermal conductivity of 0.16w/mk, thermal resistance of 0.085sq.m k/w, categorised as Class-1, when tested to BS 476 Part-7) painted and screw fixed to the GI framework with 12.5mm dia dry wall screws @ 230mm c/c, including finishing the joints in the board flush with fillers, to give a smooth, seamless joints, cleaning of	35	m^2			

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					Figures	Words	
		surfaces, fixing etc. the panels being fixed on both sides of frame work including providing and fixing Gypsum boards along the exposed edges of frame work and painting the boards with aproved shade plastic emulsion paint conforming to IS:5411.					
171	01AR.10.7.4	12.5mm thick Gypsum board panels in panelling (conforming to IS : 2095, having thermal conductivity of 0.16w/mk, thermal resistance of 0.085sq.m k/w, categorised as Class-1, when tested to BS 476 Part-7) painted and screw fixed to the GI framework with 12.5mm dia dry wall screws @ 230mm c/c, including finishing the joints in the board flush with fillers, to give a smooth, seamless joints, cleaning of surfaces, fixing etc. the panels being fixed on one side of framework only and painted with approved shade plastic emulsion paint conforming to IS:5411.	35	m^2			
172	01AR.10.7.5	5.5mm thick toughened glass panels (conforming to IS :5437) in partitions with putty, 12mm x 10mm second T.W beading on Teak Wood frame (50mm x partition depth) fixed to MS frame work in the partition including adjustment of partition members, finishing etc. all complete.	23	m^2			
173	01AR.10.9	Tray type Aluminium plank false ceiling					
174	01AR.10.9.1	Providing and fixing Tray type Aluminium plank false ceiling consisting of 254/305mm x 1264mm or 600mm x 600mm size Aluminium planks (profiled for positive engagement into clip-in profiles and demounting of individual planks) manufactured out of 0.7mm thk. Aluminium alloy 3105/3005/5052 (as per ASTM 209M) with stove enamelled (coil coated) finish in approved colour and suspension system consisting of 0.5mm thk. 40mm x 20mm galvanised steel clip-in main runner profiles (@ 1264mm or 600mm as per plank size) supported by and including 0.5mm thk. 25mm x 16mm GI suspension angle,1mm thk. 25mm x 34mm x 76mm CRCA zinc plated steel ceiling brackets (@ max. 1264mm c/c or 600mm as per profile) fixed to roof slab/beam,0.5mm thk. 40mm wide, 105mm high G.I. hold on clamps slotted for level adjustment, perimeter angles including providing slit openings for fixing supply/return air grill, lighting fixtures, AC ducts etc. all complete. .	1200	m^2			
175	01AR.10.12	underdeck insulation consisting of rigid Polyisocyanurate foam (PIR) slabs					
176	01AR.10.12.1	Providing and fixing in position underdeck insulation consisting of rigid	1200	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		Polyisocyanurate foam (PIR) slabs of size 1000 x 500mm and thickness of 30mm (covered on one side with glass fibre tissue/ Aluminium foil having 50mm overlap) conforming to IS:12436 having density not less than 32 kg./ Cu. M., thermal conductivity (K- value) not more than 0.023 w/mk measured at 10 deg. C; classified as 'Class I' for surface spread of flame as per BS 476, part 7; fixed to R.C.C. slab by hot blow grade bitumen of 85/25 grade or cold adhesive CPRX applied over a coat of bituminous primer @ 0.5 Litres/ Sq.M. applied to bare R.C.C. surface and to the two surface of each PIR panel and pressed in position (while the bitumen is still tacky) with the help of G.I. screws (No. 8 x 75mm long) fixed into rawl plugs (holes in R.C.C. for the rawl plugs shall be drilled prior to applying coat of bituminous primer) of size 8 x 25mm inserted (5 nos. for each slab- One each at 4 corners and one at center) and G.I washers 25mm dia; including covering the overlaps with approved quality sealing compound (MAS-94 or equivalent); chicken wire mesh 24G x 19mm shall then be fixed to G.I screws and tightened with lacing wire; including preparation of surface consisting of cleaning R.C.C surface of all dust, dirt and loose particles by wire brushing; etc. all complete as per approved manufacturer's standard specifications and recommendations.					
177	01AR.10.15	Providing and installing/ fixing in position 600mm-1000mm high truly levelled and aligned cavity/ false flooring system having load bearing capacity of uniformly distributed load of minimum 2025 kg/ sq.m. and point load of 675 Kg., the system consisting of: (i) Sub-structure/ pedestal assembly (designed for speedy assembly/ removal for relocation/ maintenance) of zinc electro plated steel comprising of: a. 90mm x 90mm x 4mm embossed pedestal head attachment mechanically riveted to a 90mm long, minimum 19mm dia threaded bright M.S. rod stud with check nuts for level adjustment (for upto 25mm) and arresting vertical movement, anti-vibrational PVC cap (for panel and stringer location), b. CRCA (Electrical resistant welded) Pedestal of 32mm dia (OD), 2mm thick pipe mechanically reduced to four ribs at top to accommodate head assembly, mechanically locked to maintain true plumb welded to pedestal base plate. c. Pedestal Base plate 150mm x 150mm x 4mm thick (with stiffening folds) fixed/					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		anchored to main concrete floor @ 600mm c/c both ways (for installing flooring tiles) by means of adhesive or fastener as recommended by Manufacturer. (ii) Stringers of minimum sectional size 20mm x 32mm x 1.2mm made of hot dip galvanized steel cold rolled construction with ribs embossed on 3 sides (designed for strength, lateral stability, rolling loads and to support panels on all four sides for alignment), having counter sunk holes at both ends for fixing to pedestal head assembly with M6 machine screws. (iii) Removable and re-usable Floor panels of size 600mm x 600mm made of all steel welded construction (cleaned, degreased and phosphated with 11 tank process, finished with 40-60 micron epoxy coating (and, heated to achieve adhesion to the panel surface and corrosion resistance) with bottom surface consisting of multiple hemispherical and reverse cones and top plain sheet (fuse welded at 129 locations) to form an enclosed panel of an overall depth 37mm; the inner empty core of the panel injected with light weight fire retardant, non-combustible cementitious compound (at high pressure to fill all crevices of the panel), each panel finished on top with 2mm thick fire retardant floor grade high pressure laminate/ 2mm thick anti-static PVC tiles in approved design/ shade/ texture; fixed to flooring panel by means of approved adhesive; the edges of the finished panels provided with conductive PVC edge trim 5mm wide on all sides (mechanically locked and sealed in place). The item includes: i) Providing and fixing all accessories like screws, bolts, adhesive etc. as per manufacturer's specifications. ii) Making necessary adjustment in grid dimensions, stringer lengths, floor panel dimensions etc. at ends or centre (to cater to specific room sizes) or at panels locations, as required. iii) Cutting of floor panels as required at ends. iv) Treating the underneath cement concrete floor with one component polyurethane floor coating etc. all complete. v) Providing additional steel structural supports/ pedestal assembly at edges, cut outs etc. as required. vi) Providing all necessary accessories such as outlet boxes, grommets, Panel lifters (at least one for each building) as required etc. all complete.					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
178	01AR.10.15.1	False flooring panels with 2mm thick fire retardant floor grade high pressure laminate conforming to BS : 476 part - 7 on a semi-automated lamination line in approved design/ shade/ texture.	50	m²			
179	01AR.10.15.3	False flooring panels with minimum 10mm thick polished mirror or mat finished vitrified tiles in approved design/ shade/ texture.	1200	m²			
180	01AR.10.17	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recomme-nded jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer¿s specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		painting with:					
181	01AR.10.17.2	12.5 mm thick tapered edge gypsum fire resistant board conforming to IS: 2095- Part I	500	m²			
182	01AR.10.17.3	12.5 mm thick tapered edge gypsum moisture resistant board	70	m²			
183	01AR.11	MISCELLANEOUS ITEMS					
184	01AR.11.1	Sealing 25mm thick, 50mm wide expansion joints with premium grade two part poly-sulphide sealant (based on LP liquid sulphide) over and including primer (specially developed for use with polysulphide sealant material and as approved) and back-up materials of polyethylene strip or other bondbreaker (all as per manufacturer's specification), sealant being mixed (the base and the curing agent thoroughly mixed with slow speed electric mixer) and applied by sealant gun and `sealant application kit' including drying of surfaces before application by wire brushing, finishing etc. all complete.	80	RM			
185	01AR.11.6	Providing and laying plinth protection with Bldg. drain as per EIL STD. No. 7-75-0065 consisting of					
186	01AR.11.6.1	Plinth protection of PCC (1:3:6) laid over rammed earth to slope and trowel finished. Cement supplied by the Contractor at their cost.	600	m²			
187	01AR.11.6.3	Building drain consisting of brick work, PCC (1:3:6) laid over rammed earth and finished with 15mm thick plain cement plaster topped with neat cement finish @ 2.75kg. of cement per Sq.M of area including finishing curing etc. all complete. Cement supplied by the Contractor at their cost.	250	m²			
188	01AR.11.6.6	Extra for providing 600mm long MS grating drain cover as per EIL STD No. 7-75-0065 made of 40mm x 6mm M.S. flat framework with 40mm x 6mm MS flats welded @ 35mm c/c including providing & fixing 50mm x 50mm x 6mm M.S. angle frame fixed to concrete portion of the drain.	550	nos			

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					Figures	Words	
189	01AR.11.7	50mm dia GI pipe spouts					
190	01AR.11.7.1	Providing and fixing in position 50mm dia GI pipe spouts to slope for drainage of canopy, chajja etc., including puncturing the masonry /RCC and grouting with M-15 grade concrete, finishing etc. all complete.	4	RM			
191	01AR.11.10	Providing and laying cinder concrete filling in sunk slabs of Toilets etc. consisting of -					
192	01AR.11.10.1	Average 18mm plain cement plaster (1 cement : 6 sand by volume) with waterproofing compound conforming to IS : 2645 mixed @ 3% by weight over RCC slab including preparing the base surface, finishing with one floating coat of neat cement slurry @ 2.75 Kg. of cement per Sq.M of area, including curing, finishing etc. all complete. Cement supplied by the Contractor at their cost.	2.5	m^2			
193	01AR.11.10.3	Cinder concrete (1 cement : 10 cinder of 12mm size and down grade) over cement plaster including consolidating, finishing, curing, maintaining slope etc. all complete.Cement supplied by the Contractor at their cost.	3	m^3			
194	01AR.11.11	Silicon/acrylic based water repellant finish					
195	01AR.11.11.1	Providing and applying one coat of silicon/acrylic based water repellant finish as per aproved manufacturer's specifications on wall surfaces including filling all cracks with white cement and matching pigment cleaning the surface of all dust before evenly applying with brush, curing, drying the coated surfaces for 24 hours etc. all complete.	7	m^2			
196	01AR.11.21	Transformer gates/ fencing					
197	01AR.11.21.1	Providing and fixing Transformer gates/ fencing made of 50mm x 50mm x x 4.5mm M.S. tubular frame, 40mm x 40mm x 3.2mm M.S. tubular stiffeners, 50mm x 50mm x 8 gauge welded mesh fixed to the frame by 20mm x 3mm M.S. flat beading on either side, including fixing the gate and frame to the masonry/ R.C.C. by M.S. hinge arrangement (consisting of fabricated hollow M S Cylinder made of 5 Thk MS plate with 20 internal dia fixed to the shutter & RCC/masonry by means of 2 nos 6 Thk MS Flats welded on it.) with M.S. holdfast grouted with M-15 concrete block with gate having M.S. pivot arrangement (ensuring smooth operation of the gate), one heavy duty 450mm long M.S. aldrop, heavy duty M.S. tower bolts etc. including finishing of	35	m^2			

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					Figures	Words	
		the entire gate/ fencing with fittings/ fixtures/ accessories with two or more coats of synthetic enamel paint of approved make and shade over a coat of approved red oxide zinc chromate primer, all complete as per EIL-STD No 7-75-0051 rev-04 & 7-75-0052 rev-03.(All above materials to be procured by contractor)					
198	01AR.11.22	1000 mm high satin finish stainless steel (SS 304 grade) tubular railing					
199	01AR.11.22.1	Supplying, assembling and installing 1000 mm high satin finish stainless steel (SS 304 grade) tubular railing of approved design in staircases, ramps, around floor cut outs etc. consisting of: 1. 50mm dia SS pipe top handrail 2. 32 mm dia SS pipe balusters (at every third step for staircase, @ maximum 1200mm c/c for ramp, floor cutouts) 3. 3 nos minimum 18mm dia SS pipe intermediate handrails. Including: 1. Fixing balusters to floor with 4 nos bolts änd 8mm thick, 100mm dia SS base plate & SS cap/collar. 2. Fixing top handrail to the balusters with 12mm dia SS bar connector & 6mm thick SS saddle plate. 3. Fixing intermediate handrails to the balusters with 12mm dia SS bar connector. 4. All end caps, decorative caps over balustrades,necessary bending, welding, polishing of all welded joints (Length of top handrail shall be measured for payment).	260	RM			
200	01AR.11.25	Providing and fixing Toilet cubicle system of overall height of 2000mm made out of 18 and 12 mm thick compact laminated board , in select colours as per manufacturer shade card, with 18mm thick front panels and doors with SS U-section top rail on top side for better rigidity to be supported by adjustable SS leg 100 to 150 mm height, 12mm thick continuous divider/ intermediate panels of maximum depth 1500 mm without any joints fixed to wall and front by using U profile, door size 600 x 1800 (for handicap toilet 900 x 1800) with front panel cut and fixed as per the requirement, maximum width of the front panel including door to be 1100 mm (for handicap toilet 1600mm provided with a 10 x 10mm rebate on both the sides of door and front panel with 2mm thick silicon rubber lining pasted in the rebate for noise reduction of the					

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					Figures	Words	
		door. Each cubicle shall be equipped with the following necessary hardware: SS316 - primary thumb turn/ indicator lock - 1no. SS316 - Door know. Handle set - 1 no. SS316 - Coat hoos - 1 no. SS316 - Auto reverse hinge with cap - 3 nos. SS316 - 150 mm height adjustable leg - 2 nos. SS316 - l-bracket, corner fixing wherever required. The square meter area of from panels and doorMode of measurement - Square meter basis , front panel and door measurement will be taken from wall to wall and floor to top rail, divider measurement to be taken from wall to front and the total height of the divider.					
201	01AR.11.25.1	Area of front panels and door measured from floor to top rail	5	m^2			
202	01AR.11.25.2	Area of divider/ intermediate panel measured as/actual	5	m^2			
203	01AR.11.26	Steel Entrance Gates					
204	01AR.11.26.1	Providing and fixing in position Steel Entrance Gates consisting of 40mm x 80mm x 3.2mm M.S. tubular frame, 80mm x 40mm x 3.2mm rectangular M.S. hollow sections & 32x32x2.6 mm MS rectangular hollow sections, both horizontal & vertical members welded to the framework and intermediate curved rectangular hollow section as per standard design, locking arrangement, 25mm thick, 75mm dia M.S. wheel with ball bearing including fixing the gate to RCC/ masonry by M.S. hinge arrangement (fabricated/ machined as per detail) and M.S. hold fast (25 x 6 x 200mm long) grouted with M-20 grade concrete, providing and fixing M.S. pivot, 50mm x 50mm x 6mm M.S. Tee bent to shape and embedded in road surface for gate opening track, gate stopper, painting the gate with approved shade and quality synthetic enamel paint (two coats) and a coat of approved quality primer, ensuring smooth operation of the gate etc. all complete as per EIL- STD-No. 7-75-0054.	5	m^2			
205	01AR.12	LANDSCAPE CIVIL WORKS					

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					Figures	Words	
206	01AR.12.1	EARTHWORK Supplying and filling in good quality earth including fine dressing to levels specified, watering, ramming consolidating and dressing etc. all complete.	3	m^3			
207	01AR.12.2	HARDCORE FOR SUB BASE Providing and laying HARDCORE sub base with stone aggregate 63 to 40mm size and approved binding material including screening, sorting, spreading, packing and consolidation with half tonne roller to template etc. all complete.	3	m^3			
208	01AR.12.3	GUNITED SPRAYED CONCRETE WATERPROOFING Providing and laying GUNITED SPRAYED CONCRETE WATERPROOFING (40mm thk.) in Waterbody areas consisting of mix 1:2:4 (1 cement: 2 coarse sand: 4 coarse aggregate of 10mm nominal size) over G.I. Wire mesh of approved weight per sq.m. using appropriate equipment & the following operations: a) Cleaning the surfaces where gunited concrete is to be applied, b) Fixing of G.I. wire mesh with approved fasteners on surface, c) Applying sprayed concrete d) Finishing the surface with trowel to achieve smooth finish etc. all complete.	20	m^2			
209	01AR.12.4	FINISHES FOR ROAD & PARKING AREA					
210	01AR.12.4.1	Providing and laying approved GRANITE COBBLE STONE (shotblasted finish, size 100x100x100mm thk. or as/ design) as per approved pattern used in drop off areas, laid over 100mm thk. PCC base & well compacted sub base/ WBM as per approved paving pattern including rubbing, polishing and grout etc. all complete.	20	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
211	01AR.12.4.3	Providing and laying of approved INTERLOCK PAVERS (rough finish with solar reflectance index value higher than 0.5, size 100x200x80mm or as/ design) in road and parking area bands, laid over 100mm thick sand base over well compacted subbase/ WBM and mortar with joints filled in fine sand as per manufactured requirements etc. all complete.	18	m^2			
212	01AR.12.4.4	Supplying and laying CONCRETE INTERLOCKED GRASS PAVERS laid over 100mm thk. sand base over well compacted subbase/ WBM and mortar with joints filled in fine sand as per manufactured requirements etc. all complete.	18	m^2			
213	01AR.12.4.5	Supplying and laying of POLYCARBONATE GRASS TRACK PAVERS (Ovilite or equivalent) with self anchoring pegs, made of high impact resistant HDPE. The base of the panel is equipped with a slot opening for drainage. The grass paver to have interlock system to lock each other and should have compressive strength of minimum 150 tons/sq.m., capable to take the load of the fire tender, should have high level of porosity greater than 90%, porous for grass, shrubs and low planters laid over 50mm sand bed over well compacted subbase/ WBM as per manufacturer specifications etc. all complete.	18	m^2			
214	01AR.12.6	CLADDING AND COPING					
215	01AR.12.6.5	Providing and fixing approved GLASS MOSAIC TILES (Color - Shades of blue, Size - 20x20x6mm or as/ design, Bisazza or equivalent) used in waterbodies, fixed with approved low VOC content adhesive including rubbing, polishing and grout etc. all complete.	18	m^2			
216	01AR.12.7	MISCELLANEOUS FINISHES					
217	01AR.12.7.1	Providing & laying 50-70mm dia polished white Indian MARBLE PEBBLES laid loose in layers including rubbing, polishing, etc. all complete.	18	m^2			

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					Figures	Words	
218	01AR.12.7.2	Providing and applying approved EPOXY PAINT of required shade on steel work (two or more coats) as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. all complete.	18	m^2			
219	01AR.12.8	PERGOLA/ TRELLIS					
220	01AR.12.8.1	Providing and fixing of STAINLESS STEEL SECTIONS (Size of members-30x30,50x100mm, 75x100mm, 75x150mm, 100x200, 150x150, 150x300mm or as/ design) for pergola framework covered with 2mm dia S.S. wiremesh fixed with frame including cutting, hoisting, fixing in position using structural steel etc. all complete as required.	18	m^2			
221	01AR.14	CLADDING,FACADES ETC.					
222	01AR.14.2	Providing and fixing in position minimum 25mm thick granite stone (in dry cladding) of uniform colour and size by means of Stainless steel clamps (of Hilti/ approved equivalent make) of minimum weight 250 gms and of minimum 5mm thickness with various offset lengths from 50-65mm and 80-120mm, fastening the clamps with ETA approved universal anchors and pins etc. (of Hilti/ approved equivalent make) for fixing/ anchoring in masonary/ RCC using sufficient number of clamps/ anchors/ pins all as per approved manufacturer's standard details and fixing sequence/ methodology to ensure stable cladding system (with a guarantee for a time span of not less than 15 years) including sealing the joints with polyurethane based adhesive sealant ('SIKAFLEX 11FC of SIKA India Pvt. Ltd' or approved equivalent) and applying one or more coats of Silicon based water repellant coat ('SIKAGUARD 703W of SIKA India Pvt. Ltd' or approved equivalent) on front side of the stone cladding incl. cost of scaffolding etc. complete in all respect for all heights as per the instruction of Engineer-in-charge.					
223	01AR.14.2.1	Granite stone dry cladding with clamps of 304 hybrid grade (of Hilti/ approved	4	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		equivalent make).					
224	01AR.14.3	Providing, supplying and installing at site Glass Reinforced Concrete (GRC) Claddings, made up of mainly White Cement (conforming to ASTM C 150), High Silica sand (conforming to ASTM c144), AR Glassfibre, Admixtuers (conforming to ASTM c260,ASTM c618), by using Spray Process and as recommended by PCI (Precast Institute) USA, Manual 128 (edn4) or as per GRCA International specifications with design as per details provided in drawings and site requirements/ measurements and as per approved finish and color shade, with sealers and hardwares required, all in accordance with the manufacturer's specifications and conforming to Indian/ ASTM standards, along with submission of shop drawings for approval, complete in all respects.	4	m^2			
225	01AR.14.4	Providing, supplying and installing at site Glass Reinforced Concrete (GRC) Jallis (Grills), made up of mainly White Cement (conforming to ASTM C 150), High Silica sand (conforming to ASTM c144), AR Glasfibre, Admixtuers (conforming to ASTM c260,ASTM c618), by using Vibration Cast Premix Process and as recommended by PCI (Precast Institute) USA, Manual 128 (edn4) or as per GRCA International specifications with design as per details provided in drawings and site requirements/ measurements and as per approved finish and color shade, with sealers and hardwares required, all in accordance with the manufacturer's specifications and conforming to Indian/ ASTM standards, along with submission of shop drawings for approval, complete in all respects.	3	m^2			
226	01AR.14.5	Designing, engineering, providing and fixing in position fully sealed and air, water and weather tight structural glazing system comprising of framing system (mullions, transoms etc.) made from extruded, powder coated (min. 30 microns in approved colour) aluminium alloy HE9WP (conforming to IS:733) of commercial quality, free from all defects/ impairing appearance especially selected to fulfil the design requirements spelt out in the specifications; machine cut glass infill panels (of size as per the design) made of minimum 6mm thick hard coated (Glaverbel Stopsol or approved	130	m^2			

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					Figures	Words	
		equivalent in approved shade) reflective toughened glass, the glazed framing panel formed by means of special structural quality silicone adhesive sealant applied on all four sides (between glazing panel unit and aluminium alloy framing system) and fixed to framing system. The item includes fixing the framing system to the RCC framed structure/ masonry walls by providing and fixing necessary Aluminium brackets (with flexible joints); with other fastening devices like bolts, anchors, etc. (made from Stainless Steel grade 316, rivets and pins of aluminium alloy of appropriate grade as required) self locking type and torque tightening type; also including providing smooth membrane of Teflon (Min. 1.0 mm thickness), providing (at all joints of the framing, glazed panels as well as joints between aluminium frame with concrete and/ or masonry) of adhesive silicon sealant and superior quality approved make EDPM gaskets, cleaning etc. all complete.					
227	01AR.14.6	Providing and erecting/ fixing/ installing in position aluminium composite panels system (for external application) of 'Alucobond'/ 'Eurobond'/ 'Reynobond' or approved equivalent comprising of aluminium framework consisting of 40mm x 40mm x 4mm thick x 100mm long aluminium angle cleats (bracket) suitably spaced and placed to comply to design/ elevation/ colour pattern etc. and fixed to masonry/ RCC column/ beam of the building by means of M8 x 65mm long G.I Anchor bolts, aluminium continuous vertical angle 40mm x 40mm x 4mm fixed/ bolted to angle cleats by means of M8 x 25mm long nut and bolt arrangement, suitable horizontal aluminium angle horizontal members as required; cladding panels 4mm thick (overall thickness) made of high quality extrusion grade LDPE/ LLDPE core material (3mm thick) sandwiched between 0.5mm thick aluminium foil (on either side) made of aluminium alloy 1100-H18 or approved equivalent and finished with minimum 35 micron (5 micron primer and 25 micron top coat) thermoplastic PVDF layer 'Kynar 500' (minimum 70%) and polyester coating in approved shade; all complete including providing approved silicon sealant at all joints, necessary accessories like backing rods, aluminium pop rivets, bolts, screws, corner pieces etc. as required for the completion of the work as per the approved manufacturer's specifications and recommendations, cleaning, finishing etc., all complete.	110	m^2			

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228	01AR.14.8	Structural glazing system with DGU Designing, engineering, providing and fixing in position fully sealed and air, water and weather tight Structural glazing system comprising of framing system (mullions,transoms etc.) made from extruded, powder coated (min. 30 microns in approved colour) aluminium alloy HE9WP (conforming to IS:733) of commercial quality, free from all defects/ impairing appearance especially selected to fulfil the design requirements spelt out in the specifications; 24mm thick hermetically sealed double insulated toughened glass (6mm high performance blue green shade toughened glass on outside + 12mm dry air gap by a metal spacer filled with dehydrating agent inside the unit to prevent moisture formation between the two panes +6mm thick clear toughened glass on in side) Glass type -GT3 performance characteristic shall be as given below or better than: (i) Light transmission : 40%-50% (ii) External Reflection : 10-20% (iii) Internal Reflection : 15%-20% (iv) Shading coefficient : <0.28 (v) Solar Factor : <=0.25 (vi) U Value : 1.5 to 1.8 W/m2 degree K (of size as per the design), the glazed framing panel formed by means of special structural quality silicone adhesive sealant applied on all four sides (between glazing panel unit and aluminium alloy framing system) and fixed to framing system. The item includes fixing the framing system to the RCC framed structure/ masonry walls by providing and fixing necessary Aluminium brackets (with flexible joints); with other fastening devices like bolts, anchors, etc. (made from Stainless Steel grade 316, rivets and pins of aluminium alloy of appropriate grade as required) self locking type and torque tightening type; also including providing smooth membrane of Teflon (Min. 1.0 mm thickness), providing (at all joints of the framing, glazed panels as well as joints between aluminium frame with concrete and/ or masonry) of adhesive silicon sealant and superior quality approved make EDPM gaskets, cleaning etc. all complete.	35	m²			
229	01AR.14.9	Extra for top hung open out (openable) window panel	4	m²			

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					Figures	Words	
		Extra over structural glazing for providing and fixing top hung open out (openable) window panel including providing and fixing of two point locking handles of approved design, heavy duty aluminium approved quality hinges with concealed 4 points peg stay of aluminium or heavy duty friction stay of approved make suitable to withstand the required wind pressure and shutter loads all fittings and fixtures to be concealed except hinges/stay and handle, complete in all respects with necessary hardware and fittings such as friction hinges, lockable handles etc.of approved make. (Weight of aluminium frame, excluding rough ground, shall be taken as 3.0 Kg. Per sq m)					
230	01AR.16	Fire rated Doors/ Windows and Partitions					
231	01AR.16.3	P/F Fire rated Single glazed door with panic bar Providing and fixing 2 hours fire rated, fully glazed, single shutter doors consisting of steel door frame, shutter including stiles, rails, insulation, transparent glass, sealant and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per Specification and approved Manufacturer's details.	9	m^2			
232	01AR.16.4	P/F Fire rated Double glazed door with panic bar Providing and fixing 2 hours fire rated, fully glazed, double shutter doors consisting of steel door frame, shutter including stiles, rails, insulation, transparent glass, sealant and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per Specification and approved Manufacturer's details.	18	m^2			
233	01AR.16.5	Fire rated Single Steel door without panic bar Providing and fixing 2 hours fire rated, single shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, door closer,	4	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		motice lock, handle, door stopper including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.					
234	01AR.16.6	Fire rated Double Steel door without panic bar Providing and fixing 2 hours fire rated, double shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, door closer, motice lock, handle, door stopper including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	4	m^2			
235	01AR.16.7	Fire rated Single Steel door with panic bar Providing and fixing 2 hours fire rated, single shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt etc. including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	19	m^2			
236	01AR.16.8	Fire rated Double Steel door with panic bar Providing and fixing 2 hours fire rated, double shutter steel doors consisting of steel door frame, shutter, vision panel, insulation and hardware such as hinges, panic bar, locks/ trims for panic bar, door closer, door stopper, concealed flush bolt including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.	35	m^2			
237	01AR.16.9	Fire rated glazed partition Providing and fixing 2 hours fire rated, glazed partition of desired design consisting of steel frame, insulation and transparent glass and glazing beading, matrix mineral boards, intumescent putty, fire resistant acrylic sealant etc. all complete including	10	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		preparing fabrication/ installation drawings including fixing with masonry, partition etc. all complete as per specification and approved Manufacturer's details.					
238	01AR.MF03	MISCELLANEOUS					
239	01AR.MF03.01	Aluminium louvered window/ventilator of minimum 2mm thick, overall 75mm wide approved shade electrostatically powder coated Aluminium sheet louvers fixed @ 50mm, bend to shape including providing minimum 3mm Aluminium sheet side members for framing the louvers including fixing the louver-frame to window/ ventilator frame, providing all accessories etc. all complete, all members (louvers, louver frame, window/ventilator frame etc.) being of Aluminium and of similar electrostatically powder coating finish.	20	Kg			
240	01AR.MF03.02	Supply, Installation, Testing and Commissioning of Horizontal Type Industrial Grade Air-Curtain with removable washable filter (warranty in the name of Owner) suitable for air-conditioned premises to be installed on the wall above Doors of desired width upto 3.0m along with necessary supporting arrangement including mounting bracket and fasteners etc., as per the following specifications: Power supply of 230 V AC, 50Hz, housing made up of durable Stainless steel (SS), Sound level not more than 68 dB when measured at 1m from source, having air discharge velocity of minimum 10 m/sec and air flow rate more than 1200m3/hr, equipped with overload protection, two speed control motor (copper winding) with operation of speed control by external switch, automatic on and off operation through photo-sensor when door is being opened and closed, Sensor (photo-sensor) supply, installation as required along with supply of 1 no. of spare sensor, removal front panel for easy installation and maintenance, including all tools, tackles, accessories, fixing at designated location above the door, etc. all complete as per specifications and instructions of the engineer-in-charge.	5	nos			
241	01AR.MF03.03	Providing and fixing Stainless steel plate 304grade of 1.50mm thick, including writing with Embossing of letters of required size including fixing at required placed with studs, screws and rawl plugs etc. compete as per direction of engineer-in-charge.	5	sqm			
242	01AR.MF03.04	Supplying and fixing of Pictogram of brush finish over steel plate depicting man/	4	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		woman in square shape of size 150 x 150 x 2mm thick (of approved make) etc. all complete as per direction of Engineer In-charge.					
243	01AR.MF03.05	Supply and installation of 88mm x 426mm x 2mm thick signage with L bracket indicating "WASH ROOMS" in letters and suspended from ceiling with necessary hardware etc. all complete as per the direction of Engineer In-charge.	4	nos			
244	01AR.MF03.06	Supply & Fixing of manufactured factory made sandwich panel in roofing having Minimum 50mm thick Trapezoidal Noncombustible Stone wool core /Euro Class A1per EN 13501-1 having density 100 + 4 kg per cum as per IS 8183 , Melting point > 1000 degree Celsius as per ASTM E794 3, Thermal conductivity -0.040 W/mk , when tested in accordance with ASTM C518 , having U value 0.80 (W/m2K). Both side of panel elements shall be made of 0.50 mm thick steel facers with minimum yield Stress of 300 N/mm2 Coated with Aluminium - Zinc Alloy Coating AZ150 (150 gms/m2) having micro ribbed profile on both sides conforming to IS 15965:2012. The color coating should be of approved color at least 25-micron polyester coating including 5-7 micron primer in exposed surface and back coat 10-12 micron including 5-7 micron primer, with guard film for internal & external facers and further Color coated with super durable polyester (SDP) paint coat with guard Film. The external facers to have trapezoidal ribs at every 250 mm centers having rib height of 35 mm. The Internal sheet shall be microribed. Panel side laps are designed to ensure continuous insulation with complete weathertight performance achieved through anti capillary groove & sealants. Self-drilling fasteners shall be corrosion resistant plated steel with EPDM washer or Aluminum pop rivets. Size of the fasteners /rivets shall be as per design. Panels shall be engineered to provide required fastener by using appropriate flashings along with silicon sealant wherever applicable. All the operation including Structural support required to fix the panels is included in the scope and shall be completed in all respect as per drawings, Manufacturer's specifications and direction of Engineer-in-Charge.	350	sqm			
245	01AR.MF03.07	Supply & Fixing of manufactured factory made Sandwich panel in cladding having Minimum 50mm thick Non-combustible Stone wool core /Euro Class A1 per EN 13501 -1 having density 100 + 4 kg per cum as per IS 8183 , Melting point > 1000 degree Celsius as per ASTM E794 3. Thermal conductivity -0.040 W/mk , when tested in	30	sqm			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		accordance with ASTM C518 having U value 0.80 (W/m2K).Both side of panel elements are made up of 0.50 mm thick steel facers with minimum yield Stress of 300 N/mm2 Coated with Aluminium - Zinc Alloy Coating AZ150 (150 gms/m2) having micro ribbed profile on both sides conforming to IS 15965:2012. Panels shall have a compressive stress of 57 kPa .Shear Stress of 27 kPa when tested in accordance with EN 12090. when tested according to EN826 The color coating should be of approved color at least 25-micron polyester coating including 5-7-micron primer in exposed surface and back coat 10-12 micron including 5-7-micron primer, with guard film for internal & external facers and further Color coated with super durable polyester (SDP) paint coat with guard Film. The external & Internal finish sheet shall be micro-ribed. Selfdrilling fasteners shall be corrosion resistant plated steel with EPDM washer or Aluminum pop rivets. Panel shall be fixed vertically fixed with tongue N groove joint. Panels shall be engineered to provide required fastener by using appropriate flashings along with silicon sealant wherever applicable. All the operation including Structural support required to fix the panels is included in the scope and shall be completed in all respect as per drawings, Manufacturer's specifications and under the overall direction of Engineer-in-Charge.					
246	01AR.MF03.08	Providing and fixing U Baffle Aluminium panel ceiling of approved Wooden Finish MWBN colour consisting of panel size 150mm deepX50 mm width using 0.7m thick, panelling upto 4mtr,Coil Coated on a Continuous Paint Line, Double baked and roll for med from enamelled corrosion resistance Aluminium alloy AA3005(Al.Mg) for higher strength and good roll forming characteristics. Panels shall be clipped to a baked enamelled Aluminium carrier of 30 mm wide x 47mm high x 0.5mm thick, Black Colour coated, one leg of the carriers with cutouts to hold the panels in a module of 200mm.Panel carrier shall be suspended by means of threaded rod at a distance of 1.8mtr c/c. The baffle shall be manufactured on high speed, high precision roll forming machine with ARKU SIX Hi configuration roller levelling process to ensure the flatness and to avoid the failure of metal at corners which may occur normally on press brake machine. Paint Finish: Aluminium panels shall be chromatised for maximum bond between metal and paint enamelled twice under high temperature, Exposed side with a full primer and finish coat on a Continuous Paint Line. Ceiling	20	sqm			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		Finish above U Baffle Ceiling: Ceiling area above U Baffle to be painted in black colour before fixing this system. The baffle ceiling system should meet the required standards for Green Pro certification and should qualify as green product as per CII green products and services council. The manufacturer should be ISO9001:2015 Quality Management System Certification compliant with in house testing facility and should have their own manufacturing plant in India. Measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.					
247	01AR.MF03.09	Providing and laying tactile tile (for vision impaired persons as per standards) of size 300x300x9.8mm having with water absorption less than 0.5% and conforming to IS: 15622 of approved make in all colours and shades in for outdoor floors such as footpath, court yard, multi modals location etc., laidon 20mm thick base of cement mortar 1:4 (1cement : 4 coarse sand) in all shapes & patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction of Engineer-in-Charge.	20	sqm			
248	01AR.MF03.10	Providing and laying waterproofing cum insulation system over roof consisting of: a) one coat of polyurethane primer @6-8 sq m area/ Litre over prepared roof surface, b) minimum 1.5mm DFT polyurethane water proofing coating applied by spray or brush (in minimum two layers, with scrim cloth reinforcement in between the layers) c) 40 mm thick polyurethane foam insulation applied in layers with spraying machine over the primer coat, d) minimum .8 mm DFT polyurethane water proofing coating applied by spray or brush (in minimum two layers, with scrim cloth reinforcement in between the layers) e) 150 GSM Geo textile membrane overcured Polyurethane water proofing coating f) finishing protective layer of minimum 50 mm thick PCC (1:2:4, inpanels of maximum size 2500mm x 2500mm, chequered finish, reinforced with 24 G wire netting, laid in	2500	sqm			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		slope), (PCC thickness more than 50 mm shall be paid extra) all including cleaning and surface preparation of the roof surface, providing 75mm radius fillets with P.C.C. (1:2:4) at junctions of horizontal and vertical surfaces finished smooth; 450mmx 450mm khuras (rain water collecting pits) at all outlets, testing for water leakage, scrim cloth reinforcements at junction of horizontal and vertical surfaces and also nearopenings for rainwater pipes/ outlets,continuing the waterproofing up the parapets/ walls for a minimum of 150mm over the finished roof surface, continuing into rainwater pipes by at least 100 mm etc, supply of all materials, finishing, curing etc. all complete as per job specification, drawings and directions of Engineer-In-Charge					
249	01AR.MF03.11	Providing & fixing at all heights and locations Letters made up of Stainless steel, grade 316 of approved make made out of laser cut shape in required design, language & font, including buffing, polishing and fixing by sufficient numbers of fasteners/ high quality chemical tape/ adhesive/fastener of approved make, all complete as per architectural drawings and direction of Engineer in charge. Hollow letters made of SS sheet of 1.5 mm thickness a) letters with depth of 50 mm	450	per letter per cm height			
250	01AR.MF03.12	Providing & fixing at all heights and locations Letters made up of Stainless steel, grade 316 of approved make made out of laser cut shape in required design, language & font, including buffing, polishing and fixing by sufficient numbers of fasteners/ high quality chemical tape/ adhesive/fastener of approved make, all complete as per architectural drawings and direction of Engineer in charge. Hollow letters made of SS sheet of 1.5 mm thickness a) letters with depth of 75 mm	300	per letter per cm height			
251	11CS	CIVIL, STRUCTURE AND ARCHITECTURE					
252	11CS.9	WOOD AND P. V. C. WORK					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
253	11CS.9.121	Providing and fixing Fiber Glass Reinforced plastic (FRP) Door Frames of cross-section 90 mm x 45 mm having single rebate of 32 mm x 15 mm to receive shutter of 30 mm thickness. The laminate shall be moulded with fire resistant grade unsaturated polyester resin and chopped mat. Door frame laminate shall be 2mm thick and shall be filled with suitable wooden block in all the three legs. The frame shall be covered with fiber glass from all sides. M.S. stay shall be provided at the bottom to steady the frame.	40	metre			
254	11CS.9.122	Providing and fixing to existing door frames.					
255	11CS.9.122.1	30 mm thick Glass Fibre Reinforced Plastic (FRP) panelled door shutter of required colour and approved brand and manufacture, made with fire - retardant grade unsaturated polyester resin, moulded to 3 mm thick FRP laminate for forming hollow rails and styles, with wooden frame and suitable blocks of seasoned wood inside at required places for fixing of fittings, cast monolithically with 5 mm thick FRP laminate for panels conforming to IS: 14856, including fixing to frames.	28	sqm			
256	11CS.11	FLOORING					
257	11CS.11.47	Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS: 15622, of approved brand & manufacturer, in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS: 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).					
258	11CS.11.47.2	Size of Tile 600x600 mm	50	sqm			
259	11CS.11.47.4	Size of Tile 1000x1000 mm	5	sqm			
260	11CS.11.48	Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling / grouting and finishing complete as per direction of Engineer-in-charge.					
261	11CS.11.48.2	Size of Tile 600x600 mm	400	sqm			
262	11CS.11.48.4	Size of Tile 1000x1000 mm	20	sqm			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
263	11CS.11.49	Providing and laying Vitrified tiles in floor with different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).					
264	11CS.11.49.2	Size of Tile 600x600 mm	300	sqm			
265	11CS.11.49.4	Size of Tile 1000x1000 mm	20	sqm			
266	11CS.13	FINISHING					
267	11CS.13.41	Distempering with 1st quality acrylic distemper (ready mixed) having VOC content less than 50 gram/litre, of approved manufacturer and of required shade and colour all complete to achieve even shade and colour :					
268	11CS.13.41.1	New work (two or more coats) over and including water thinnable priming coat with cement primer having VOC content less than 50 gram/litre	1725	sqm			
269	11CS.13.48A	Finishing walls with ready mixed Premium acrylic emulsion paint having VOC less than 50 gm/litre and UV resistance as per IS 15489:2004, Alkali & fungal resistance, dirt resistance exterior paint of required shade (Company Depot Tinted) with silicon additives.					
270	11CS.13.48A.1	New work (Two or more coats applied @ 1.43 litre/ 10 sqm. Over and including priming coat of exterior primer applied @ 0.90 litre/10 sqm.	1725	sqm			
271	11CS.13.83	Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/ litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.					
272	11CS.13.83.1	One coat	100	sqm			
273	11CS.13.83.2	Two coats	500	sqm			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
274	11CS.13.85	Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content.					
275	11CS.13.85.3	With water thinnable cement primer on wall surface having VOC content less than 50 grams/litre	500	sqm			
276	11CS.13.116	Polishing in high gloss/matt finish melamine clear polish on wood work in required color/wooden shade texture with following process in the sequence as detailed below: 1. The surface to be polished is rubbed with sand paper 80/120 no. and then with sand paper of 160/180 nos. 2. Applying two coats of sealer with spray gun and allowing sufficient drying time for 1st coat and 2nd coat is allowed to dry for 8 to 12 hrs. 3. On drying of sealer coat, wet rubbing with emery cloth of finer grading with ample water to remove excess sealer layer and make the surface further smooth after this wet rubbing, then surface is applied with special grade melamine fillers to fill all the small and big holes/grooves etc. Filler coat to be allowed to dry for 4 to 6 hrs on which again a light wet rubbing is done and this surface is further allowed to dry for 12 hrs. 4. On this, 1st coat of melamine polish is applied with spray gun using melamine clear polish and melamine thinner in required proportion. This 1st coat is allowed to dry for 24 hrs then this dry surface is again fine wet rubbed smooth, which is further allowed to dry for 12 hrs. The final melamine polish is applied with compressor pressure spray gun using melamine clear polish and melamine thinner mixed in required proportion complete as per direction of Engineer-in-Charge. (Final coat to be done in 1 or 2 layers without gap of time)	4	sqm			

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Schedule of Rates
for
Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0** Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	27 / 02 / 2026	Issued for Bidding	LOVE PANCHAL	AMITABH KISHORE	AMITABH KISHORE
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01GC	GENERAL CIVIL					
2	01GC.13	Supply and installation of valves					
3	01GC.13.1	Supply and installation of screwed valves as per piping material specification including fixing in position with threaded connections complete as per drawings, specifications and directions of Engineer-in-charge.					
4	01GC.13.1.3	Globe valve for following nominal sizes and piping material class					
5	01GC.13.1.3.1V2	Dia 1 Inch Piping Material Class J2A	12	each			
6	01GC.15	MISC. CIVIL AND STRUCTURAL WORKS FOR U/G PIPING AND OTHER CIVIL WORKS					
7	01GC.15.ME01	Providing 20mm 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. All materials including cement supplied by the contractor.	30	sqm			
8	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.					
9	01GC.15.2.2	All materials including cement supplied by the Contractor.	100	m^2			
10	01GC.15.3	Providing 16mm 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, inspection chambers, septic tanks,Compound wall, 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.					
11	01GC.15.3.2	All materials including cement supplied by the Contractor.	30	m^2			
12	01GC.15.6	Supplying and fixing in position medium/ heavy duty CI manhole frame with lugs and					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		cover conforming to IS-1726 including breaking of brick masonry or concrete surface to receive frame with lugs and making good the same with CM 1:3 including applying two coats of anticorrosive paint inclusive of all labours and materials etc. complete					
13	01GC.15.6.1	circular size 500 mm dia. Medium duty of grade MD-10	5	each			
14	01GC.15.6.2	circular size 560 mm dia. Heavy duty of grade HD-20	5	each			
15	01GC.15.8	Providing cement mortar grouting on brick masonry / RCC wall for filling free space between pipe body and masonry wall/concrete wall with 1:2 (1 cement: 2 sand) mortar including packing, consolidating, curing, finishing, etc. complete as per drawings specifications and directions of Engineer-in-Charge.					
16	01GC.15.8.2	All materials including cement supplied by the Contractor.	5	m^3			
17	01GC.15.13	Supplying, construction , testing & commissioning of RCC Neutralisation pit concrete , providing lean concrete 1:5:10 (1 cement : 5 sand : 10 aggregate) at bottom of Neutralisation pit and PCC 1:2:4 at Finished Grade Level, rungs, lime fill, acid proof lining, chequered plate with lifting hooks, grouting in 1:2 cement mortar(1 cement :2 sand), painting with bitumen primer and Epoxy paint, grouting between pipe and pit wall in 1:2 cement mortar (1 cement : 2 sand), reinforcement steel including straightening, cleaning, cutting, bending, keeping in proper position, centering, shuttering etc. including earth work in excavation in all types of soil except soft rock and hard rock, backfilling & disposal of surplus earth for all leads within the complex limit etc. complete as per standards, drawings, specifications and directions of Engineer-in-charge.					
18	01GC.15.13.2	All material including cement supplied by the Contractor For following grade of concrete.					
19	01GC.15.13.2.1V2	grade of concrete M30	3	each			
20	01GC.15.15	Providing 13mm thick average cement plaster in cement mortar 1:6 (1 cement: 6 sand) on brick walls/stone masonry/pitching or on concrete surfaces for manholes, valves pits, culverts, walls, etc. including cleaning and preparation of the surface, scaffolding, curing etc. for all depths and heights complete as per drawings specifications and	50	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		direction of Engineer-in-Charge. All materials including cement supplied by the Contractor.					
21	01GC.22	PLUMBING AND BUILDING DRAINAGE					
22	01GC.22.ME02	Providing and fixing approved stone ware 100mmx100mm dia. gully trap as per EIL Std. no.7-65-0214 including grating with CI frame and cover 400mmx400mm including solid concrete block masonry chamber in 1:4 cement mortar(1 cement: 4 sand) on M-20 grade cement concrete foundation, plastered inside and outside surfaces with 1:3 cement mortar (1 cement: 3 sand) with 13mm average thickness including providing and fixing light duty CI frame and cover, painting CI frame and cover with two coats of chlorinated rubber zinc phosphate primer @ 40µ DFT per coat and finish painting consists of two coats of chlorinated rubber paint @40µ DFT per coat, earth work in excavation, backfilling, removal of surplus earth, benching with M-20 grade cement concrete and rendering smooth with a neat coat of cement slurry etc. all complete as per drawings, specifications and directions of Engineer-in-Charge. All materials including cement supplied by contractor.					
23	01GC.22.ME02.01	Gully trap	12	each			
24	01GC.22.12	Supplying, laying and jointing of above ground approved quality UPVC pipes to be used for soil and waste discharge application inside buildings confirming to IS:13592 (Type-B) and fittings confirming to IS: 14735 with all necessary specials such as bends, Y junction, T junction (both single and double) plugs, coupler, adapter, shoes etc. including solvent welded jointing and testing as per IS: 7634 (Part-3), cutting floors/walls and making good the same after fixing including supply and fixing hooks/ clamps etc. complete as per drawings, specifications and directions of Engineer-in-Charge. For the following Nominal Bore (NB) pipe:					
25	01GC.22.12.1	(All materials including cement supplied by contractor)					
26	01GC.22.12.1.1V2	Nominal Dia. 75 mm	70	m			
27	01GC.22.12.1.1V	Nominal Dia. 90 mm	70	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
	3						
28	01GC.22.12.1.1V4	Nominal Dia. 110 mm	130	m			
29	01GC.22.13	Supplying, laying and jointing of underground approved quality UPVC pipes to be used for soil and waste discharge application inside buildings confirming to IS:13592 (Type-B) and fittings confirming to IS: 14735 with all necessary specials such as bends, Y junction, T junction (both single and double), plugs, coupler, adapter etc. including solvent welded jointing and testing as per IS: 7634 (Part-3), cutting in floors, earth work in excavation, encasing the pipe in 50mm thick PCC M20, backfilling and disposal of surplus earth / debris to demarcated area anywhere within plant complex limit etc. complete as per drawings, specifications and directions of Engineer-in-Complete. For the following Nominal Bore (NB) pipe:					
30	01GC.22.13.1	(All materials including cement supplied by contractor)					
31	01GC.22.13.1.1V1	Nominal Dia. 75 mm	70	m			
32	01GC.22.13.1.1V2	Nominal Dia. 90 mm	70	m			
33	01GC.22.13.1.1V4	Nominal Dia. 110 mm	130	m			
34	01GC.22.19	Supply and installation on terrace/ staging, circular drinking water tank, of polyethylene with PUF insulation for temperature control, material conforming to BIS codes including supply and installation of all fittings, cover with suitable locking arrangement, float valve, making necessary holes for inlet, outlet and overflow connection and vent pipe etc. and the base supports for tank including supply of all necessary material all complete as per specifications and directions of Engineer-in-charge. For following capacities					
35	01GC.22.19.1V1	Capacity 1000 Litre	8	each			
36	01GC.22.20	Supplying and fixing approved quality UPVC Floor Trap with CP pressed steel grating as per IS: 14735 including cutting floors and making good the same, etc., making inlet	13	each			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		and outlet connections, etc. complete for 100mm inlet and 75mm outlet as per drawings, specifications and directions of Engineer-in-Charge.					
37	01GC.22.21	Supplying and fixing approved quality UPVC Floor Trap with CP pressed steel grating as per IS: 14735 including cutting floors and making good the same, etc., making inlet and outlet connections, etc. complete for 100mm inlet and 90mm outlet as per drawings, specifications and directions of Engineer-in-Charge.	13	each			
38	01GC.22.22	Construction, supplying, installation, testing and commissioning of septic tank as per standards and IS:2470 Part-I , with all necessary accessories like inlet, outlet pipes, vent pipes, manhole covers, rungs etc. including earthwork in excavation in all type of soil except soft and hard rock, backfilling and disposal of surplus earth for all leads etc. complete as per standards, drawings, specifications and directions of Engineer-in-Charge.					
39	01GC.22.22.01V1	All materials including cement supplies by the contractor No. of Users 10 nos	1	each			
40	01GC.22.22.01V4	All materials including cement supplies by the contractor No. of Users 50 nos	1	each			
41	01GC.22.23	Preparation of internal building plumbing and sanitary piping layouts for building as per National Building Code/ Relevant IS codes and getting the same approved by Owner/ PMC.					
42	01GC.22.23.1V90	Building Name SRR-11	1	each			
43	01GC.22.23.1V91	Building Name Substation-JP1	1	each			
44	01GC.22.23.1V92	Building Name Gate House	1	each			
45	01GC.22.23.1V93	Building Name Substation JU1 & SRR-12	1	each			
46	01GC.25	ACID RESISTING BRICK/ TILE LINING					
47	01GC.25.2	Supply and laying of unglazed vitreous acid resisting tiles confirming to IS: 4457, applying silicate/ resin mortar for jointing as per IS: 4832 (Part I/ II) including applying bitumen primer and 19mm thick bitumen mastic on cement plaster surfaces/ masonry/ RCC surface. The thickness of the tiles shall be minimum 16mm. The size of the tile shall be 300mm x 300mm. Including supply of all materials, finishing, curing, testing etc. as per drawings , specifications and directions of Engineer-in-charge.	70	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
48	01GC.26	MISCELLANEOUS ITEMS					
49	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.	1	each			
50	01GC.28	NDT Testing					
51	01GC.28.1	DYE PENETRATION / MAGNETIC PARTICLE TEST Performing of magnetic particle test or dye penetration test including supply of all necessary materials, equipment and labour for carrying out the work as per specs. and direction of Engineer-in -charge					
52	01GC.28.1.1	DP TEST LENGTH(BW&SW)□	10	Inch			
53	01GC.28.1.2	MAGNETIC PARTICLE TEST□	10	Inch			
54	01GC.28.3	RADIOGRAPHY :- 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. 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'.					
55	01GC.28.3.1	FOR JOINTS THK. <= 8MM (FOR CS OTHER THAN CLASS IV OF SPEC FOR NDT REQUIREMENT OF PIPING)					
56	01GC.28.3.1.1V2	Nominal Dia. 4 Inch	4	nos			
57	01GC.28.3.1.1V3	Nominal Dia. 6 Inch	4	nos			
58	01GC.28.3.1.1V6	Nominal Dia. 2 Inch	4	nos			
59	01GC.28.3.1.1V7	Nominal Dia. 1 Inch	4	nos			
60	01GC.30	Installation of Valve					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
61	01GC.30.1	Transportation of all kind of valves(including special and motor operated valves) from owner's storage point to contractor's store/ work site and installation of valves for all rating including assembly of valve accessories, if any, fixing of gaskets, bolts/ nuts etc. complete as per specifications drawings and direction of Engineer-in-charge including returning all unused/ surplus material to owner's storage point (valves along with accessories shall be supplied by owner as free issue material)					
62	01GC.30.1.1	Flanged/ Wafer Valves					
63	01GC.30.1.1.1V1	Nominal Dia. 6 Inch	4	nos			
64	01GC.30.1.1.1V4	Nominal Dia. 1 Inch	4	nos			
65	01GC.30.1.1.1V5	Nominal Dia. 4 Inch	8	nos			
66	01GC.30.1.1.1V10	Nominal Dia. 2 Inch	3	nos			
67	01GC.30.1.1.1V17	Nominal Dia. 1.5 Inch	2	nos			
68	01GC.34	Rain Water Recharging Well					
69	01GC.34.1	Construction of rain water recharging well including earthwork in excavation in all types of soils excluding soft rock and hard rock, excavation in soft rock and hard rock shall be paid under relevant item, backfilling and disposal of the debris/surplus earth within a lead of 100 m, supply of all filler materials, mild steel perforated pipe, precast cover slab, brick masonry etc all complete as per EIL standard drawings, specifications and directions of Engineer-in-charge. (Depth of well upto 10.0m from ground level) For catchment area:					
70	01GC.34.1.1	Up to 500 Sqm	1	each			
71	01GC.34.1.2	Above 500 sqm and up to 1500sqm	2	each			
72	01GC.34.1.3	Above 1500 sqm and up to 3000sqm	1	each			
73	01GC.36	Portable/ trolley mounted Extinguishers					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
74	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.					
75	01GC.36.1.1V2	Capacity in Kg 6	80	nos			
76	01GC.36.5	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.					
77	01GC.36.5.1V2	Capacity in Kg 4.5	80	nos			
78	01GC.38	Painting of A/G pipes and valves					
79	01GC.38.1	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 painting specification, drawings and direction of Engineer-in-Charge for all types of un insulated 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. 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 hydro testing. 2. No extra payment shall be made for identification (line numbering etc.) of insulated and uninsulated lines.					
80	01GC.38.1.1	Painting of uninsulated surfaces for ' Industrial marine ' environment as per painting specification for CS piping for design temp group: -14 to 80 (Deg C) including surface preparation. For following pipe sizes					
81	01GC.38.1.1.1V1	Nominal Dia. 1 Inch	20	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
82	01GC.38.1.1.1V3	Nominal Dia. 4 Inch	20	m			
83	01GC.38.1.1.1V5	Nominal Dia. 6 Inch	110	m			
84	01GC.38.1.1.1V10	Nominal Dia. 2 Inch	10	m			
85	01GC.38.1.1.1V20	Nominal Dia. 1.5 Inch	10	m			
86	01GC.38.1.2	Painting of uninsulated surfaces for ' Industrial marine ' environment as per painting specification for CS piping for design temp group: -14 to 80 (Deg C) including surface preparation. For following valve sizes					
87	01GC.38.1.2.1V1	Dia. Of Valve 1 Inch	8	each			
88	01GC.38.1.2.1V3	Dia. Of Valve 4 Inch	8	each			
89	01GC.38.1.2.1V4	Dia. Of Valve 6 Inch	3	each			
90	01GC.38.1.2.1V9	Dia. Of Valve 2 Inch	8	each			
91	01GC.41	Supply, fabrication and Erection of piping(underground)					
92	01GC.41.6	Water System Galvanised Pressure Piping (Under Ground) (Screwed)					
93	01GC.41.6.1	Supplying and laying carbon steel galvanised pipes as per piping materials specification Class underground including supply of all necessory fittings including Tee, reducing Tee, reducing Coupling, nipple, coupling, elbows etc. supply of teflon tapes, PTFE tape, white lead, etc. cutting the pipes to required lengths, making threads, earthwork in excavation for trenches, etc. in all types of soil except soft rock & hard rock including dewatering, shoring and strutting if required, dressing of sides, levelling, grading and ramming of bottoms, including laying of pipes in trenches, jointing the pipes and fittings with threaded connections, hydrostatic testing of the piping, backfilling the trenches with selected/approved earth fill material, cutting of roads wherever required, making good the road surface after laying, disposal of surplus earth at a designated area anywhere within complex limit etc., complete as per specifications, drawings and directions of Engineer-in-Charge. For following Nominal Size and Piping Material Class.					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
94	01GC.41.6.1.1V1	Nominal Dia 1 Inch Piping class J2A	90	m			
95	01GC.41.6.1.1V5	Nominal Dia 2 Inch Piping class J2A	70	m			
96	01GC.41.10	UNDERGROUND SEWER SYSTEM - RCC PIPES					
97	01GC.41.10.1	Supplying and laying underground R.C.C. pipes sewers with socket and spigot ends conforming to IS:458 of approved make, to proper grade and alignment, including earthwork in excavation in all types of soil except soft and hard rock for pipe trenches upto 2.0m depth of excavation, etc. including dewatering, shoring and shuttering if necessary, dressing of sides, leveling, grading and ramming of bottoms, cutting the R.C.C. pipes to required lengths, lowering the pipes, jointing, including connecting the pipes to manholes and grouting the pipe body with manhole wall using cement mortar 1:2 (1 cement : 2 sand), testing, draining of water and cleaning of pipe after testing, 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 15cm compacted thickness , watering and compacting with mechanical means like vibro rammers etc. to 90% standard proctor density as per IS:2720 Part-VII, making good the surface, including cutting of roads wherever required and making good the same, disposal of surplus earth/ unserviceable material to demarcated area anywhere within the complex limit etc. complete for all depths as per drawings, specifications and instructions of Engineer-in-Charge.(All material shall be supplied by contractor) For following Pipe size (mm) and Class (pipe sizes are all internal diameter of the pipes)					
98	01GC.41.10.1.1V1	Dia. (Internal) 150 mm Pipe Class P1	130	m			
99	01GC.42	Fabrication and Erection of piping (Above ground)					
100	01GC.42.1	PIPING (ABOVE GROUND): Transportation of all piping items from owner's storage point to work site/workshop, fabrication including cutting, edge preparation (including grinding the edges of pipe, 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 of all type and thickness over pipe sleepers, overhead on racks and at all elevations, connecting with					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		equipment nozzles, strainers, orifice assemblies, tapping for pressure gauges etc., fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fitting like elbows, reducers, tees, vents, drains, SW valves upto 1.5 NB, alignment, cleaning & flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other type of testing as specified, draining, drying by compressed air completing all such works in all respects (including preparation of isometrics as mentioned in the scope of work for the job) as per drawings, specifications and instruction of Engineer-in-charge. (Pipes and fittings shall be supplied by owner as free issue material)					
101	01GC.42.1.1	Carbon Steel Piping (Non IBR), Thickness <=10 mm					
102	01GC.42.1.1.1	Fabrication, For the following nominal sizes					
103	01GC.42.1.1.1.1	NB upto 1.5 inch	40	Inch Dia			
104	01GC.42.1.1.1.2	NB 2 inch - 6 inch	40	Inch Dia			
105	01GC.42.1.1.2	Erection , for Water System (Pressure Piping), For following Nominal Sizes					
106	01GC.42.1.1.2.1	NB upto 1.5 inch	30	Inch Mtr			
107	01GC.42.1.1.2.2	NB 2 inch - 6 inch	30	Inch Mtr			
108	01GC.42.1.ME03	PIPING (ABOVE GROUND): Transportation of all piping items from owner's storage point to work site/workshop, including providing internal cement lining on pipes and specials as per specification for cement lining, fabrication including cutting, edge preparation (including grinding the edges of pipe, fittings, flanges etc. to match with the mating edges of uneven/different thickness wherever required), fitup, bending, preheating wherever required, welding, including providing pipe joints as per specifications including supply & erection of collars for pipe joints and laying of pipes of all type and thickness over pipe sleepers, overhead on racks and at all elevations, connecting with equipment nozzles, strainers, orifice assemblies, tapping for pressure gauges etc., fixing of gaskets, bolts, nuts including application of torque wherever required and all other inline instruments and fitting like elbows, reducers, tees, vents, drains, SW valves upto 1.5 NB, alignment, cleaning & flushing by water/compressed air, hydrostatic, pneumatic, vacuum, spark testing and any other					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		type of testing as specified, draining, drying by compressed air completing all such works in all respects (including preparation of isometrics as mentioned in the scope of work for the job) as per drawings, specifications and instruction of Engineer-incharge. (Pipes and fittings shall be supplied by owner as free issue material)					
109	01GC.42.1.ME03.01	Dia. 4 Inch PMS A94Y	20	metre			
110	01GC.42.1.ME03.02	Dia. 6 Inch PMS A94Y	130	metre			
111	01GC.43	Supply, fabrication and Erection of piping (Above ground)					
112	01GC.43.2	Miscellaneous G.I. PIPING (ABOVE GROUND)					
113	01GC.43.2.1	Supplying and laying ABOVE GROUND mild steel galvanized pipes as per piping material specification, including supply and installation 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 technological structures etc. including joining of pipes and fittings with threaded/ flanged connections etc. hydrostatic testing of the piping including supply of necessary fittings etc. and pipe supports complete as per data sheets, specifications, drawings and instructions of Engineer-in-charge.					
114	01GC.43.2.1.1V1	Dia. 2 Inch PMS J2A	70	m			
115	01GC.43.2.1.1V2	Dia. 1 Inch PMS J2A	70	m			
116	01GC.51	fire fighting equipment's					
117	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.					
118	01GC.51.5.3	Double headed landing valve	9	each			
119	01GC.51.5.5	First Aid hose reel wall mounted type	9	each			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
120	01GC.51.5.8	Hose box cabinet Type-II (Wall mounted type) including all inside accessories, including all civil works, fixing in position with anchor bolts in foundations or wall	9	each			
121	01GC.99	Miscellaneous Items					
122	01GC.99.01	Miscellaneous					
123	01GC.99.01.ME01	Supply and installation of an Air release valve in the piping network, as per the datasheet B895-999-81-45-DS-8021 attached to the tender, as per the standards, specifications, and directions of the Engineer in Charge.	3	each			
124	01GC.99.01.ME03	Supply and installation of portable Clean Agent Type extinguisher (MS body) with HFC or Fluro ketone having BIS marking as per IS 15683 having a minimum fire rating of 2A, 21B 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. 4kg capacity	1	each			
125	01GC.99.01.ME04	Supply and installation of portable Clean Agent Type extinguisher (MS body) with HFC or Fluro ketone having BIS marking as per IS 15683 having a minimum fire rating of 2A, 21B 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. 2 kg Capacity	3	each			
126	11CS	CIVIL, STRUCTURE AND ARCHITECTURE					
127	11CS.18	WATER SUPPLY					
128	11CS.18.7	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. Internal Work - Exposed on wall:					
129	11CS.18.7.3	25 mm nominal dia Pipes	130	metre			
130	11CS.18.8	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc.					
131	11CS.18.8.1	15 mm nominal dia Pipes	80	metre			
132	11CS.18.8.2	20 mm nominal dia Pipes	130	metre			
133	11CS.18.8.3	25 mm nominal dia Pipes	130	metre			
134	11CS.18.9	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External Works:					
135	11CS.18.9.1	15 mm nominal dia Pipes	70	metre			
136	11CS.18.9.2	20 mm nominal dia Pipes	70	metre			
137	11CS.18.9.3	25 mm nominal dia Pipes	130	metre			

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Schedule of Rates
for
Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0**						
Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	03 / 03 / 2026	Issued for Bidding	NAGARAJU NAIK BHUKYA	SAI ACHUTUNI	RAMAN SOOD
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

Print Date & Time : 13/05/2026 03:23:26 PM ; Printed By: LOTAVATH THAVURYA (A213)

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01EE	ELECTRICAL WORKS					
2	01EE.1040	MISCELLANEOUS CONTROL GEAR					
3	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.					
4	01EE.1040.10.10	Weight of the unit up to 5 kg.	16	nos			
5	01EE.1040.10.20	Weight of the unit above 5 kg. but upto 20 kg.	2	nos			
6	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.					
7	01EE.1040.20.20	With start and stop (latching type) push buttons.	8	nos			
8	01EE.1060	PLUGS, SOCKETS AND JUNCTION BOXES					
9	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.					
10	01EE.1060.10.40	63 A, 415 V, 5 pin sockets along with associated 5 pin plugs.	8	nos			
11	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.					
12	01EE.1060.30.70	240 V, 15 A, 3 pin socket.	25	nos			
13	01EE.1060.30.80	240 V, 15 A, 3 pin Plugs for item no. 01EE.1060.30.70	25	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
14	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.					
15	01EE.1060.40.70	FLP (II C) and WP 3 way JB complete with 3 Nos. FLP (II C) cable glands and 1 Nos. blocking plug suitable for cables upto 3 x 2.5 sq. mm YWY / XWY cable.	25	nos			
16	01EE.1090	CANOPIES					
17	01EE.1090.50	Supply, fabrication and installation of GI 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.					
18	01EE.1090.50.10	Lighting Panel/Power panel/distribution junctions boxes.	2	nos			
19	01EE.1090.50.30	Push button stations.	2	nos			
20	01EE.1100	ANCHOR FASTENERS					
21	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.					
22	01EE.1100.10.10	3/16" BSW.	10	nos			
23	01EE.1100.10.20	5/16" BSW.	10	nos			
24	01EE.1100.10.30	1/4" BSW.	10	nos			
25	01EE.1100.10.40	3/8" BSW.	10	nos			
26	01EE.1100.10.50	5/8" BSW.	10	nos			
27	01EE.1100.10.60	1/2" BSW.	10	nos			
28	01EE.2010	SUPPLY OF MV CABLES					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
29	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.					
30	01EE.2010.30.20	3 C x 2.5 sq. mm	500	m			
31	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.					
32	01EE.2010.50.190	3.5 C x 35 sq. mm	50	m			
33	01EE.2010.50.230	3.5 C x 50 sq. mm	50	m			
34	01EE.2040	LAYING OF CABLES					
35	01EE.2040.20	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, trefoil clamps (for single core cables) 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					
36	01EE.2040.20.10	Cables with OD upto 20 mm.	2500	m			
37	01EE.2040.20.20	Cables with OD above 20 mm but upto 30 mm.	50	m			
38	01EE.2050	END TERMINATIONS					
39	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,					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
40	01EE.2050.100.10	Cables with OD upto 20 mm.	25	nos			
41	01EE.2050.100.20	Cables with OD above 20 mm but upto 30 mm.	25	nos			
42	01EE.2050.100.30	Cables with OD above 30 mm but upto 40 mm.	10	nos			
43	01EE.2070	G.I. & PVC PIPES					
44	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.					
45	01EE.2070.10.20	50 mm NB.	25	m			
46	01EE.2070.10.50	100 mm NB.	200	m			
47	01EE.2070.10.70	150 mm NB.	50	m			
48	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.					
49	01EE.2070.20.20	50 mm NB.	25	m			
50	01EE.2070.20.50	100 mm NB.	25	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
51	01EE.2070.20.70	150 mm NB.	25	m			
52	01EE.2080	STRUCTURAL STEEL					
53	01EE.2080.20	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 Table-10 of specification 6-79-0020 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 1 kg. or less shall neither be measured nor paid).	900	kg			
54	01EE.2080.40	Supply and installation of supports for push button stations, Fire Alarm BGU/MCPs, etc., complete with base plate, foundations bolts, grouting and painting(as per Table-10 of specification 6-79-0020 suitable for highly corrosive environment) etc., including all labour and materials, as per approved drawings and directions of Engineer-in-Charge.					
55	01EE.2080.40.20	As per std. 7-51-0307	1	nos			
56	01EE.2090	CABLE - TRAYS					
57	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.					
58	01EE.2090.10.10	300 mm wide Straight run cable tray.	300	m			
59	01EE.2090.10.570	Horizontal bends for 300 mm wide tray with 1000 mm bending radius.	2	nos			
60	01EE.2090.10.610	Vertical outside bends for 300 mm wide tray with 1000 mm bending radius	2	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
61	01EE.2090.10.650	Vertical inside bends for 300 mm wide tray with 1000 mm bending radius	2	nos			
62	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.					
63	01EE.2090.30.10	100 mm wide.	450	m			
64	01EE.2090.30.20	150 mm wide.	230	m			
65	01EE.2090.30.30	60 mm wide.	230	m			
66	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.	25	m^2			
67	01EE.2090.100	Providing and fixing 1.6mm thick GI fabricated raceways in partition include providing removable 3mm thick cover with knockout holes and fixing accessories, earthing connectivity for the complete length, including floor / wall supports, access boxes as per specification and cross over as per site requirement.					
68	01EE.2090.100.10	300X40X1.6/3MM	50	m			
69	01EE.2090.100.20	250X40X1.6/3MM	50	m			
70	01EE.2090.100.30	200X40X1.6/3MM	50	m			
71	01EE.2090.100.40	150X40X1.6/3MM	50	m			
72	01EE.2090.110	Providing and fixing 2 mm thick G.I. fabricated junction box in raceways include providing removable 3mm thick cover with knockout holes and fixing accessories, earthing connectivity for the box, including floor / wall supports, access boxes as per specification and cross over as per site requirement.					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
73	01EE.2090.110.10	350X350X50X2/3MM (with GI Cover)	5	nos			
74	01EE.2090.110.20	300X300X50X2/3MM (with GI Cover)	5	nos			
75	01EE.2090.110.30	250X250X50X2/3MM (with GI Cover)	5	nos			
76	01EE.2090.110.40	200X200X50X2/3MM (with GI Cover)	5	nos			
77	01EE.2100	CABLE GLANDS					
78	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.					
79	01EE.2100.10.10	Cables with OD upto 20 mm.	10	nos			
80	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.					
81	01EE.2100.20.10	Cables with OD upto 20 mm.	10	nos			
82	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.					
83	01EE.2100.40.10	Cables with OD upto 20 mm.	30	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
84	01EE.2100.40.20	Cables with OD above 20 mm but upto 30 mm.	20	nos			
85	01EE.2100.40.30	Cables with OD above 30 mm but upto 40 mm.	10	nos			
86	01EE.2120	CABLE LUGS					
87	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.					
88	01EE.2120.10.10	All sizes upto 10 sq. mm	10	nos			
89	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.					
90	01EE.2120.20.20	All sizes from 16 to 35 sq. mm	10	nos			
91	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.					
92	01EE.2120.30.20	All sizes from 16 to 35 sq. mm	10	nos			
93	01EE.2120.30.30	All sizes from 50 to 185 sq. mm	5	nos			
94	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.					
95	01EE.2120.40.10	All sizes upto 10 sq. mm	5	nos			
96	01EE.2120.40.20	All sizes from 16 to 35 sq. mm	5	nos			
97	01EE.3030	HAZARDOUS AREA LIGHTING FIXTURES AND ACCESSORIES					
98	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.					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
99	01EE.3030.10.30	Well glass type bracket mounted.	75	nos			
100	01EE.3030.10.40	Well glass type ceiling mounted.	50	nos			
101	01EE.3030.10.60	Flood light fixtures.	6	nos			
102	01EE.3030.10.70	3-way, junction box.	6	nos			
103	01EE.3030.10.110	Tube light type, column/ceiling mounted	20	nos			
104	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.					
105	01EE.3030.20.MA01	Type FLP IIC-10 Fixtures	20	nos			
106	01EE.3030.20.520	Type FLP-LED-1 Fixtures.	50	nos			
107	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.	50	nos			
108	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.	50	nos			
109	01EE.3040	SAFE AREA LIGHTING FIXTURES					
110	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					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
111	01EE.3040.20.210	Type LED 2 Fixtures.	400	nos			
112	01EE.3040.20.220	Type LED 3 Fixtures.	30	nos			
113	01EE.3040.20.350	Type LED IND-1 Fixtures.	250	nos			
114	01EE.3040.20.360	Type LED IND-2 Fixtures.	100	nos			
115	01EE.3040.20.450	Type LED RSD-10 Fixtures.	25	nos			
116	01EE.3040.20.460	Type LED SFD-12 Fixtures.	25	nos			
117	01EE.3040.20.470	Type LED LB-1 Fixtures.	5	nos			
118	01EE.3040.20.480	Type LED HB-1 Fixtures.	3	nos			
119	01EE.3040.20.510	Type LED BK-2 Fixtures.	10	nos			
120	01EE.3040.20.550	Type LED ST-4 Fixtures.	25	nos			
121	01EE.3040.20.580	Type LED FD-1 Fixtures.	12	nos			
122	01EE.3050	FANS AND EXHAUST FANS					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
123	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.					
124	01EE.3050.10.10	300 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos			
125	01EE.3050.10.20	450 mm dia., 1 phase, 900 rpm, wall mounting type epoxy painted exhaust fan with louvres.	5	nos			
126	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			
127	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			
128	01EE.3070	SOCKETS / RECEPTACLES AND SWITCHES / MCB UNITS					
129	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.					
130	01EE.3070.10.20	6 A, 3 pin plate type flush/ surface mounting sockets/receptacles.	50	nos			
131	01EE.3070.10.40	16/6 A, 6 pin plate type flush/ surface mounting sockets/receptacles.	65	nos			
132	01EE.3070.10.60	20 A, 3 pin surface mounted industrial type switch socket with plug and sheet steel painted box.	25	nos			
133	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,					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		specifications of this tender and directions of Engineer-in-Charge.					
134	01EE.3070.20.20	6 A, plate type flush/surface mounted switches.	200	nos			
135	01EE.3070.20.40	16 A, plate type flush/surface mounted switches.	75	nos			
136	01EE.3070.20.60	32A, DP MCB unit in moulded case enclosure for window / split type air conditioner.	10	nos			
137	01EE.3080	JUNCTION BOXES (OUTDOOR / INDOOR TYPE)					
138	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.					
139	01EE.3080.10.10	3 way.	10	nos			
140	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.					
141	01EE.3080.20.10	Junction box.	5	nos			
142	01EE.3090	LIGHTING / POWER PANELS AND DISTRIBUTION BOARDS					
143	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.					
144	01EE.3090.10.MA 01	40 A, 4 pole incomer MCB isolator and 06 Nos.outgoing double pole MCBs (upto 20A) and Type-A RCCB (Sensitivity-30 mA) including supply of cable glands and lugs	5	nos			
145	01EE.3090.10.MA 02	40 A, 4 pole incomer MCB isolator and 12 Nos.outgoing double pole MCBs (upto 20A) and Type-A RCCB (Sensitivity-30 mA) including supply of cable glands and lugs	5	nos			
146	01EE.3090.10.MA	63 A, 4 pole incomer MCB isolator and 18 Nos. outgoing double pole MCBs (upto 20A)	6	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
	03	and Type-A RCCB (Sensitivity -30 mA) including supply of cable glands and lugs					
147	01EE.3090.10.MA 04	63 A, 4 pole incomer MCB isolator and 6 Nos. outgoing 32A single pole MCBs and Type-A RCCB (Sensitivity -30 mA) in each outgoing circuit including supply of cable glands and lugs	10	nos			
148	01EE.3100	WIRING					
149	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.					
150	01EE.3100.30.10	3 Nos x 1.5 sq. mm	500	m			
151	01EE.3100.30.20	3 Nos x 2.5 sq. mm	800	m			
152	01EE.3100.30.30	5 Nos x 1.5 sq. mm	700	m			
153	01EE.3100.30.40	5 Nos x 2.5 sq. mm	250	m			
154	01EE.3100.30.50	7 Nos x 1.5 sq. mm	125	m			
155	01EE.3100.30.60	7 Nos x 2.5 sq. mm	125	m			
156	01EE.3100.30.80	3 Nos x 4 sq. mm	100	m			
157	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.					
158	01EE.3100.70.10	25 mm diameter.	700	m			
159	01EE.3100.70.20	40 mm diameter.	500	m			
160	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.	1400	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
161	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.					
162	01EE.3100.90.10	1.5 sq. mm wires.	7000	m			
163	01EE.3100.90.20	2.5 sq. mm wires.	400	m			
164	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.					
165	01EE.3100.100.10	25 mm diameter.	900	m			
166	01EE.3100.100.20	40 mm diameter.	450	m			
167	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.					
168	01EE.3100.110.10	3 C x 2.5 sq. mm	450	m			
169	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					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
170	01EE.3100.120.10	3 C x 2.5 sq. mm	1400	m			
171	01EE.3120	EMERGENCY LIGHTING					
172	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.	10	nos			
173	01EE.4020	EARTH ELECTRODES					
174	01EE.4020.10	Supply, installation, testing and commissioning of GI earth electrodes, complete with earth pit as per std. 7-51-0102 and all necessary materials including excavation of earth pit, filling with charcoal and salt, back filling, providing necessary brickwork, connections, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
175	01EE.4020.10.10	GI earth electrode as per std. 7-51-0102.	140	nos			
176	01EE.4030	EARTH STRIPS					
177	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.					
178	01EE.4030.10.20	50 x 6 mm	240	m			
179	01EE.4030.10.40	25 x 3 mm	2800	m			
180	01EE.4030.10.50	100 x 12 mm	240	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
181	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.					
182	01EE.4030.20.20	50 x 6 mm	550	m			
183	01EE.4030.20.40	25 x 3 mm	950	m			
184	01EE.4030.20.50	100 x 12 mm	1800	m			
185	01EE.4040	EARTHING CONNECTION					
186	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.					
187	01EE.4040.10.10	3/8" dia (10 mm) flexible rope.	5	m			
188	01EE.4040.10.20	5/8" dia (16 mm) flexible rope.	5	m			
189	01EE.4040.10.30	8 SWG GI Wire.	5	m			
190	01EE.4050	EARTH PLATES					
191	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.					
192	01EE.4050.10.10	GI earth plate as per std. 7-51-0103.	40	nos			
193	01EE.4100	EARTHING CABLES					
194	01EE.4100.10	Supply of 1100 V grade, multi stranded Aluminium Conductor, 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.					
195	01EE.4100.10.MA	1 C x 16 Sqmm	1	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
	03						
196	01EE.4100.10.MA04	1 C x 70 Sqmm	1	m			
197	01EE.4100.10.10	1 C x 10 Sqmm	740	m			
198	01EE.4100.10.20	1 C x 25 Sqmm	240	m			
199	01EE.4100.10.50	1 C x 120 Sqmm	10	m			
200	01EE.4100.10.70	1 C x 185 Sqmm	10	m			
201	01EE.4100.10.90	1 C x 300 Sqmm	10	m			
202	01EE.4100.20	Termination & connection of leads of 1100 V grade, multi stranded Aluminium Conductor, 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					
203	01EE.4100.20.MA01	1 C x 16 Sqmm	2	nos			
204	01EE.4100.20.MA02	1 C x 70 Sqmm	2	nos			
205	01EE.4100.20.10	1 C x 10 Sqmm	25	nos			
206	01EE.4100.20.20	1 C x 25 Sqmm	10	nos			
207	01EE.4100.20.50	1 C x 120 Sqmm	2	nos			
208	01EE.4100.20.70	1 C x 185 Sqmm	2	nos			
209	01EE.4100.20.90	1 C x 300 Sqmm	2	nos			
210	01EE.5010	PLANT COMMUNICATION SYSTEM					
211	01EE.5010.20	Installation, termination and connection 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					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
212	01EE.5010.20.10	Central Exchange Panel along with associated battery, battery charger.	2	nos			
213	01EE.5010.20.20	Desk type intercom station upto 24 keys.	1	nos			
214	01EE.5010.20.30	Desk type intercom station with above 24 and upto 54 Keys.	1	nos			
215	01EE.5010.20.40	Weather Proof Intercom station with upto 3 Nos dual position Keys (FLP/Industrial type).	15	nos			
216	01EE.5010.20.50	Weather proof loudspeakers (FLP/Industrial Type).	15	nos			
217	01EE.5010.20.80	Desk type intercom station with above 54 and upto 128 Keys.	1	nos			
218	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.					
219	01EE.5010.40.10 V3	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos			
220	01EE.5010.40.10 V4	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos			
221	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.					
222	01EE.5010.50.10	PAJB with 1 nos 20 Pair incoming cable(s) and 4 nos 5 Pair outgoing cable(s)	1	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
	V2						
223	01EE.5010.50.10 V3	PAJB with 1 nos 50 Pair incoming cable(s) and 10 nos 5 Pair outgoing cable(s)	1	nos			
224	01EE.5020	TELEPHONE SYSTEM					
225	01EE.5020.10	Supply, installation, testing and commissioning of Indoor Telephone Distribution J.B. 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 Krone type terminals 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.					
226	01EE.5020.10.10 V1	TDJB Surface mounting type, suitable for 1 nos 20 Pair incoming cable(s) and 10 nos 2 Pair outgoing cable(s)	5	nos			
227	01EE.5020.10.10 V6	TDJB Surface mounting type, suitable for 1 nos 10 Pair incoming cable(s) and 10 nos 1 Pair outgoing cable(s)	2	nos			
228	01EE.5020.10.10 V21	TDJB Surface mounting type, suitable for 3 nos 50 Pair incoming cable(s) and 15 nos 20 Pair outgoing cable(s)	1	nos			
229	01EE.5020.20	Supply, installation, connection, testing and commissioning of following plug - in type sockets for Telephones extensions including supply of sheet boxes with covers connection of socket and plug, including all labour and materials, as per approved drawings, specifications of this tender and directions of Engineer-in-Charge.					
230	01EE.5020.20.20	Flush Mounting Type.	20	nos			
231	01EE.5020.30	Wiring with (No. of wires given below) 660 V grade, 0.63 mm dia. annealed tinned copper conductor, PVC insulated twin flat wire as per relevant IS in already laid surface/concealed conduit from TDJB onwards to telephone sockets including 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.					
232	01EE.5020.30.10	1 No. twin flat wire.	240	m			
233	01EE.5020.30.20	2 Nos. twin flat wires.	240	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
234	01EE.5020.30.30	3 Nos. twin flat wires.	240	m			
235	01EE.5020.30.50	5 Nos. twin flat wires.	50	m			
236	01EE.5030	FIRE ALARM SYSTEM					
237	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.					
238	01EE.5030.20.MA01	Zener Barrier	20	nos			
239	01EE.5030.20.10	Fire alarm panel.	2	nos			
240	01EE.5030.20.20	Zonal/Repeat fire alarm panels.	1	nos			
241	01EE.5030.20.50	Heat detectors.	75	nos			
242	01EE.5030.20.100	Break glass type fire alarm boxes.	40	nos			
243	01EE.5030.20.120	Exit signs.	60	nos			
244	01EE.5030.20.140	Hooters.	25	nos			
245	01EE.5030.20.150	Sirens with starters.	2	nos			
246	01EE.5030.20.160	Multi sensor type detectors	300	nos			
247	01EE.5030.20.170	Fault Isolator modules	40	nos			
248	01EE.5030.20.18	Input/Monitoring relay module	10	nos			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
	0						
249	01EE.5030.20.190	Output/Control Relay Module	10	nos			
250	01EE.5030.20.200	Hooter Acknowledge Box	15	nos			
251	01EE.5030.30	Supply of weatherproof type fire alarm junction box (FAJB) 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.					
252	01EE.5030.30.10V4	FAJB with 6 nos 2 Pair incoming cable(s) and 6 nos 2 Pair outgoing cable(s)	1	nos			
253	01EE.5030.30.10V6	FAJB with 4 nos 2 Pair incoming cable(s) and 4 nos 2 Pair outgoing cable(s)	4	nos			
254	01EE.5030.30.10V20	FAJB with 3 nos 10 Pair incoming cable(s) and 15 nos 2 Pair outgoing cable(s)	1	nos			
255	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.					
256	01EE.5030.40.10V4	FAJB with 6 nos 2 Pair incoming cable(s) and 6 nos 2 Pair outgoing cable(s)	1	nos			
257	01EE.5030.40.10V6	FAJB with 4 nos 2 Pair incoming cable(s) and 4 nos 2 Pair outgoing cable(s)	4	nos			
258	01EE.5030.40.10V19	FAJB with 3 nos 10 Pair incoming cable(s) and 15 nos 2 Pair outgoing cable(s)	1	nos			
259	01EE.5040	LAYING OF COMMUNICATION / FIRE ALARM CABLES					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
260	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					
261	01EE.5040.10.10	Cables of overall dia. upto 35 mm.	5000	m			
262	01EE.6010	CIVIL WORKS/M.S. CHEQUERED PLATE					
263	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.					
264	01EE.6010.60.10	6 mm thick M.S. chequered plate.	5	m^2			
265	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.					
266	01EE.6010.90.20 V1	Rectangular Cut Out of length 200 mm width 200 mm	5	nos			
267	01EE.8010	LAN SYSTEMS					
268	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.					
269	01EE.8010.10.10	32A, double pole incomer MCB isolator and 6 nos outgoing double pole 10A MCBs isolator with 2nos, 10A semiconducting fuses.	6	nos			
270	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			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
271	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	1	nos			
272	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.					
273	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.	40	nos			
274	01EE.9000	PAINTING & MARKING					
275	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.					
276	01EE.9000.20.10	Each alphabet/character upto 2 inch in height/length	2600	nos			
277	01EE.9000.20.20	Each alphabet/character above 2 inch and Upto 4 inch in height/length	2500	nos			
278	01EE.9000.20.30	Each alphabet/character above 4 inch and Upto 8 inch in height/length	2200	nos			
279	01EE.MA01	Supply of 1100 V grade, Copper Conductor, 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.					
280	01EE.MA01.03	2 pair x 1.5 sq.mm	5400	m			
281	01EE.MA01.04	5 pair x 0.9 mm dia.	600	m			
282	01EE.MA02	Supply of 1100 V grade, Copper Conductor, Overall shielded, twisted pair/triad, XLPE insulated, Unarmored, FRLS outer-sheathed cables of following sizes as per EIL					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		standard specification No. 6-51-0052, data sheets, specifications of this tender and directions of Engineer-in-Charge.					
283	01EE.MA02.03	2 pair x 1.5 sq.mm	80	m			
284	01EE.MA02.04	5 pair x 0.9 mm dia.	80	m			
285	01EE.MA03	ROOFTOP SOLAR PHOTOVOLTAIC SYSTEM					
286	01EE.MA03.01	Design, Engineering, Supply of grid connected rooftop solar photovoltaic power system with minimum generation output of minimum 20 kWp at the point of common coupling with main junction box supplied by vendor in GATE HOUSE. From Main Junction box in GATE HOUSE to further connection to Owner's switchboard in SS-JP1 by others. Supplied solar system shall comprise but not limited to solar PV modules including mounting frames, structures, array foundation, module inter connection etc, Array Junction boxes, Main Junction boxes and Fuse boxes / circuit breakers, Power Conditioning Units (PCU), AC power evacuation panels with bus bars and circuit breakers, Metering and protection / Isolation systems, MV Power and Control Cables including end terminations, cable trays, supports & accessories, Galvanized steel conduits & accessories, PVC pipes, ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes, cable fixing clamps, nuts and bolts, Steel materials for field fabrication etc, other accessories for both AC & DC power as required for interconnection between contractor supplied equipment, Earthing system for PV Array, DC power system, AC power system equipment, PCU etc., Lightning protection system, Data acquisition and monitoring system with remote monitoring facilities etc. as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineer-in Charge.	1	nos			
287	01EE.MA03.02	Installation, Testing and commissioning of grid connected rooftop solar photovoltaic power system as per complete MR item 01EE.MA03.01 including Earthing system, Lightning protection system, configuration of Data acquisition and monitoring system with remote monitoring facilities etc and laying and termination of cable within all equipments supplied as a part of this solar system and from PCU/AC Power evacuation panel to 415V Main distribution board in admin building and all other items as per EIL	1	Lumpsum			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineerin-Charge.					
288	01EE.MA03.03	Design, Engineering, Supply of grid connected rooftop solar photovoltaic power system with minimum generation output of minimum 95 kWp at the point of common coupling with Owners switch board in N2 Substation JU1/SRR-12. Supplied solar system shall comprise but not limited to solar PV modules including mounting frames, structures, array foundation, module inter connection etc, Array Junction boxes, Main Junction boxes and Fuse boxes / circuit breakers, Power Conditioning Units (PCU), AC power evacuation panels with bus bars and circuit breakers, Metering and protection /Isolation systems, MV Power and Control Cables including end terminations, cable trays, supports & accessories, Galvanized steel conduits & accessories, PVC pipes, ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes, cable fixing clamps, nuts and bolts, Steel materials for field fabrication etc, other accessories for both AC & DC power as required for interconnection between contractor supplied equipment, Earthing system for PV Array, DC power system, AC power system equipment, PCU etc., Lightning protection system, Data acquisition and monitoring system with remote monitoring facilities etc. as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineer-in Charge.	1	nos			
289	01EE.MA03.04	Installation, Testing and commissioning of grid connected rooftop solar photovoltaic power system as per complete MR item 01EE.MA03.03 including Earthing system, Lightning protection system, configuration of Data acquisition and monitoring system with remote monitoring facilities etc and laying and termination of cable within all equipments supplied as a part of this solar system and from PCU/AC Power evacuation panel to 415V Main distribution board in admin building and all other items as per EIL standard specification No. 6-51-0022 including all labour and materials, as per approved drawings, specifications, drawings of this tender and directions of Engineerin-Charge.	1	Lumpsum			
290	01EE.MA04	Supply, installation, connection, testing and commissioning of safe area MCB Box					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
291	01EE.MA04.01	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 Engineeer-in-Charge.	4	nos			
292	01EE.MA05	OCCUPANCY SENSOR					
293	01EE.MA05.01	Supply, Installation, testing and commissioning of Passive Infrared (PIR) technology based non-regulating programmable type Occupancy sensor having high performance, suitable for connected load up to 10 Amp, for mounting heights up to 4 meter and for 4 meter diameter coverage area along with necessary junction box, wiring, fixing arrangements, and supply of all connected materials, including programming at site, complete with all labor and material as required.	6	nos			

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Schedule of Rates
for
Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0** Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	05 / 03 / 2026	Issued for Bidding	NITIN JAIN	VENKATESAN D	SHISHUPAL CHOUDHARY
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01QQ	EQUIPMENT - PACKAGE					
2	01QQ.MC7	Supply and Installation of Central Air-Conditioning System with Water Cooled Chillers & Chilled Water Coil AHU Design, engineering, procurement of raw materials and bought out components, manufacturing, fabrication, assembly at shop, inspection, testing at manufacturer's works, shop painting (primer + finish coat), packing and delivery including supply of all commissioning spares, mandatory spares, special tools and tackles as applicable, first charge of refrigerant and lubricants for Central AC System with water cooled Chillers & chilled water coil AHUs including all auxiliaries, associated piping, valves/instruments ducting, diffusers/grilles etc., transportation from vendor's works to site, unloading at site, handling, transportation to contractor's store and from contractor's store to work site, storage at site, fabrication/assembly at site, installation and other field works including electrical, civil-structural work complete in all respect, hook up, testing, site painting, insulation, pre-commissioning, commissioning, performance guarantee run test at site, handing over to client, onsite training at project site to Owners personnel for operation & maintenance, preparation and submission of drawings & documents as per the enclosed Scope of Supply/Works (Static & Machinery Equipment, Doc. No. B895-999-80-42-SOW-8202), Job Specification (Static & Machinery Equipment, Doc. No. B895-999-80-42-SP-8202) for Building Works and other documents referred therein and instruction of engineering charge for each equipment including accessories.					
3	01QQ.MC7.1	FOR SUBSTATION JU-1 & SATELLITE RACK ROOM-12	1	Lumpsum			
4	01QQ.MC7.2	FOR PEROXIDE STORAGE BUILDING	1	Lumpsum			
5	01QQ.MC8	Supply and Installation of Free-Standing Floor Mounted Tower Split Air-Conditioning System Supply of Free-Standing Floor Mounted Tower Split Air-Conditioning System each of 3.0TR complete with all accessories and fittings, including supply of first fill of refrigerants (non-CFC and eco-friendly), remote control, transportation from vendor's					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		works to site, unloading at site, handling, transportation to contractor's store and from contractor's store to work site, storage at site, assembly at site, installation and other field works including electrical, civil-structural works complete in all respect, testing, painting, insulation, commissioning, handing over to client. Split unit shall have Floor mounted indoor unit and outside located air cooled condenser (outdoor unit) with insulated refrigerant piping, controls and line accessories, electrical and civil works (e.g. civil work related to concealing of refrigerant piping, drain piping to the nearest drain, cabling of AC units) as required including the structural steel framework, pedestal/bracket to mount the indoor and outdoor units, supports & clamps for refrigerant piping/cables, hold down nuts & bolts, spares for commissioning and start up etc. as per the enclosed Scope of Supply/Works (Static & Machinery Equipment, Doc. No. B895-999-80-42-SOW-8202), Job Specification (Static & Machinery Equipment, Doc. No. B895-999-80-42-SP-8202) for Building Works and other documents referred therein and instruction of engineer-in-charge for each equipment including accessories.					
6	01QQ.MC8.1	FOR SUBSTATION JU-1 & SATELLITE RACK ROOM-12	6	nos			

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Schedule of Rates
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Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0** Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	10 / 03 / 2026	Issued for Bidding	SAURAV SAHA	MD KAZI PARWEJ AHAMAD	SHASHANK GOEL
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01IT	INFORMATION TECHNOLOGY SERVICES					
2	01IT.20	Structured UTP LAN CABLING					
3	01IT.20.1	Supply, installation, testing (Penta Scanning) and commissioning of Structured UTP LAN Cabling including all labour and materials (Cable, Conduit, Channel), including following items as per approved drawings, specifications of this tender and directions of engineer-in-charge:					
4	01IT.20.1.5	CAT-6A LSZH-FR	2	Box			
5	01IT.20.1.13	24-port CAT-6A Jack Panel (fully loaded with 24 Nos. I/Os)	1	nos			
6	01IT.20.1.23	1-m long CAT-6A Patch Cord	15	nos			
7	01IT.20.1.24	2-m long CAT-6A Patch Cord	15	nos			
8	01IT.20.1.32	CAT-6A I/O, Faceplates, Gang-box	15	nos			
9	01IT.21	Structured OFC Cabling					
10	01IT.21.1	Supply, installation, testing and commissioning of Structured OFC Cabling including all labour and materials including following items as per approved drawings, specifications of this tender and directions of engineer-in-charge.					
11	01IT.21.1.12	OFC - 6-Core, Single-mode, LSZH, Indoor/Outdoor, Armoured	500	m			
12	01IT.21.2	Supply, installation, testing and commissioning of Fiber Optic Patch Panel including all accessories for terminating, Pigtails 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					
13	01IT.21.2.1	Fiber Optic Patch Panel					
14	01IT.21.2.1.1V1	No. of Cores 12 nos Mode Single-Mode	1	nos			
15	01IT.21.3	Supply, Installation of LSZH Patch Cord as per the specifications of this tender and directions of the Engineer-in-Charge.					
16	01IT.21.3.1	Fiber Optic Patch cord					
17	01IT.21.3.1.1V1	Type LC-LC Mode Single-Mode	4	nos			
18	01IT.21.4	Supply, Installation, Laying of pre-lubricated HDPE conduits by direct burial / through					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		cable trays / through ducts / through already available RCC Trench including civil work like weeding out vegetation, excavation upto 1m, conduit laying, pressing and backfilling of soil etc. and laying of OFC in HDPE as per the specifications of this tender and directions of the Engineer-in-Charge					
19	01IT.21.4.1	Pre lubricated HDPE					
20	01IT.21.4.1.1V1	OD 40 mm	400	m			
21	01IT.21.5	Supply, installation of OFC joint pits as per the specifications of this tender and directions of the Engineer-in-Charge					
22	01IT.21.5.1	OFC Joint Pits	1	nos			
23	01IT.21.6	Supply, installation of OFC Building Distribution Enclosure as per the specifications of this tender and directions of the Engineer-in-Charge					
24	01IT.21.6.1	OFC Building Distribution Enclosure	1	nos			
25	01IT.30	Equipment Rack - Networking, Server					
26	01IT.30.10	Supply, installation, testing and commissioning of Network Racks including all labour and materials (including Horizontal and Vertical Cable Managers) of varying sizes, as per approved drawings, specifications of this tender and directions of engineer-in-charge.					
27	01IT.30.10.2	Wall-mounted Network Rack					
28	01IT.30.10.2.1V2	Height 15 u Width 19 Inch	1	nos			
29	01IT.37	Supply and Laying of PVC conduits pipe					
30	01IT.37.1	Supply and Laying of PVC conduits as per the specifications of this tender and directions of the Engineer-in-Charge.					
31	01IT.37.1.1V3	Supply and Laying of PVC conduits of sizes OD 32 mm	200	m			
32	01IT.39	Supply and Laying of PVC channels					
33	01IT.39.1	Supply and Laying of PVC channels as per the specifications of this tender and directions of the Engineer-in-Charge.					
34	01IT.39.1.1V1	Supply and Laying of PVC channels of size OD 25 mm as per the specifications of	50	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		this tender and directions of the Engineer-in-Charge.					
35	01IT.80	Network Active Components					
36	01IT.80.3	Supply, installation, mounting, testing and commissioning of Ethernet Edge Switch(s) including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer in charge					
37	01IT.80.3.1	POE Ethernet Switch					
38	01IT.80.3.1.1V1	Total No. of Gigabit UTP Ports 24 No. of POE Ports 24 No. of Fiber Ports 4	1	nos			
39	01IT.80.4	Supply, installation, mounting, testing and commissioning of 10G SFP+ LR including all labour and materials, as per approved drawings, specifications of this tender and directions of engineer in charge					
40	01IT.80.4.1	10G SFP+ LR upto 10 Km	4	nos			

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Schedule of Rates
for
Misc. Building Works for PP Project

Tender No.: **B895-999-81-46-CF-T-8202-0**						
Description: **MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI**						
	0	24 / 02 / 2026	Issued for Bidding	HARISH KUMAR VERMA	RAAKHEE MAHANTA	RAAKHEE MAHANTA
	Rev	Date	Purpose	Prepared by	Checked by	Approved by

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
1	01CS	STRUCTURAL					
2	01CS.1	EARTH WORK (REFER SPECIFICATION NO. 6-68-0003)					
3	01CS.1.1	Earthwork excavation in soil					
4	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.	2200	m^3			
5	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.	2200	m^3			
6	01CS.1.1.3	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 3.0m and upto & inclusive of 4.5m 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.	600	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
7	01CS.1.2	Earthwork excavation in soft rock					
8	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.	8	m^3			
9	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.	8	m^3			
10	01CS.1.2.3	Earth work in EXCAVATION below ground level for all kinds of works in SOFT ROCK as classified in specification for a depth beyond 3.0m and upto & inclusive of 4.5m 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.	8	m^3			
11	01CS.1.4	Earthwork excavation by controlled blasting (Explosive/ Non-explosive)					
12	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	3	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
13	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.	3	m^3			
14	01CS.1.4.13	Earthwork in EXCAVATION below ground level for all kinds of works by Non- Explosive Blasting methods in Hard Rocks, for a depth beyond 3.0m and upto & inclusive of 4.5m 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.	3	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
15	01CS.1.6	SHORING AND STRUTTING					
16	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.	1	m^2			
17	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.	1	m^2			
18	01CS.1.7	Backfilling after execution of work					
19	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.	750	m^3			
20	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.	750	m^3			
21	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.	380	m^3			
22	01CS.1.10	Transporting & Disposing the SURPLUS EARTH AND DEBRIS					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
23	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).	180	m^3			
24	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).	180	m^3			
25	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).	180	m^3			
26	01CS.1.10.4	Transporting and disposing the SURPLUS EARTH AND DEBRIS including shrubs and vegetations from construction area beyond the initial LEAD OF 5.0 KM AND UPTO ANYWHERE within 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).	30	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
27	01CS.2	PLAIN & REINFORCED CEMENT CONCRETE: (REFER SPECIFICATION NO. 6-68-0004)					
28	01CS.2.17	PCC - Non FIM Items					
29	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.	20	m^3			
30	01CS.2.17.2	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, shuttering 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 1:4:8 by mass (1 Cement: 4 Coarse Sand: 8 Crushed Stone Aggregates/Gravels) with 40mm and down size graded crushed stone aggregates/Gravels. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.	15	m^3			
31	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			
32	01CS.2.17.6	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 above plinth level as SCREED in floor slabs, roofs, chajjas, canopies, gutters etc. for all heights including shuttering, tamping, curing etc. as specified in any shape, level, thickness, position and finishing the top surface smooth	25	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		etc. all complete as directed. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR.					
33	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.	25	m^3			
34	01CS.2.18	RCC Substrutures - Non FIM Items					
35	01CS.2.18.17	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	450	m^3			
36	01CS.2.18.22	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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	10	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
37	01CS.2.19	RCC Superstructures - Non FIM Items					
38	01CS.2.19.17	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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.	1550	m^3			
39	01CS.2.19.22	Providing and laying REINFORCED CEMENT CONCRETE OF M-30 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	10	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
40	01CS.2.20	RCC Flooring - Non FIM Items					
41	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.	80	m^3			
42	01CS.2.22	Precast Elements - Non FIM Items					
43	01CS.2.22.7	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-30 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 (Cement : 3 Coarse Sand), breaking bricks and/or concrete surfaces and making good the same etc. all complete	2	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		(excluding the Cost of Reinforcement) and as directed. All materials including cement supplied by the contractor.					
44	01CS.2.23	HYD Bars / MS Bars - Non FIM Items					
45	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.	240	MT			
46	01CS.2.25	Centering and Shuttering - Non FIM Items					
47	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.	3400	m^2			
48	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	4500	m^2			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		necessary provision for inserts, projecting dowels, anchor bolts or any other fixture etc. all complete and as specified and directed.					
49	01CS.2.26	Expansion joints - Non FIM Items					
50	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.	130	m			
51	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.	50	m^2			
52	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.	150	m			
53	01CS.2.28	Mechanical Rebar Couplers - Non-FIM items					
54	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. "	1	each			
55	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	1	each			

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Page 1136 of 2811 : B895-TENDER DOC-B895-999-81-46-CF-T-8202 : Rev. A

S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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. "					
56	01CS.2.29	Fixing Re-bars in already cast concrete - Non FIM Items					
57	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.	1	each			
58	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.	1	each			
59	01CS.4	STRUCTURAL STEEL WORKS SPEC NO. 6-68-0006					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
60	01CS.4.3	General Steel Works - Non FIM Items					
61	01CS.4.3.13	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) 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.	30	MT			
62	01CS.4.3.14	"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	1	MT			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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) 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. "					
63	01CS.4.4	Painting - Non FIM Items					
64	01CS.4.4.10	Supplying and applying FIELD PAINT SYSTEM of approved quality and shade as per Sl. No. 10.2 of Table 10.0 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. 7.2.1 of Table 7.2 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable), for steel structures (excluding ladders, spiral stairways & hand rails) at all location & levels, all complete as specified, in OFFISTE (COASTAL) areas as well as UNIT (INLAND & COSTAL) areas considering environmental classification as INDUSTRIAL MARINE. SUPPLY OF ALL MATERIAL IN CONTRACTOR'S SCOPE. (Unit rate based on Structural steel weight).	50	MT			
65	01CS.4.4.11	Supplying and applying COATING (Post-erection/ Field) of approved quality and shade as per Sl. No. 8.1 of Table 8.0 of EIL Specification No. 6-79-0020 (or as per Job Specifications, wherever applicable) for painting over the coat of shop primer & galvanisation already applied, including storage, surface preparation, degreasing, cleaning, drying, providing necessary arrangement for access, testing etc. including touching up of shop primer coat, for LADDERS, SPIRAL STAIRWAYS & 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).	0.5	MT			
66	01CS.4.5	Grouting					
67	01CS.4.5.1	Supplying & applying Grouting below the bases of structural steel members with Free-	2	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		flow Non-shrink Cementitious Grout of approved make.					
68	01CS.5	STRUCTURAL STEEL WORKS (TUBULAR/HOLLOW SECTION) (REFER SPECIFICATION NO.6-68-0007)					
69	01CS.5.5	Yst310 IS1161					
70	01CS.5.5.1	"Supplying, transporting, storing, fabricating, erecting in position and testing / examining at all locations and levels bolted and/or welded TUBULAR STEEL WORKS of all types using STEEL TUBES OF YST 310 GRADE CONFORMING TO IS:1161 in all types of trusses, girders, purlins, siderails, columns, runners, beams, ties, portals, frame work, bracings, brackets, sagrods 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 Grout/premix free flow Non Shrink Grout as specified, preparation & 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) as per EIL Specification No. 6-79-0020 (or as per Job Specification, wherever applicable) etc. all complete as specified & directed. SUPPLY OF ALL MATERIALS INCLUDING PLATES IN CONTRACTOR'S SCOPE.	30	MT			
71	01CS.5.7	Yst310 IS 4923					
72	01CS.5.7.3	"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-310 of approved make"" in all type of trusses, purlins, girders, side rails, columns, runners, beams, ties, portals, framework,bracing, brackets, sagrods 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	8	MT			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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) 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).					
73	01CS.6	MISCELLANEOUS STEEL WORKS SPECIFICATIONS NO. 6-68-0008					
74	01CS.6.15	Anchor Bolts - Non FIM Items					
75	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).	0.2	MT			
76	01CS.6.16	MS Metal Inserts - Non FIM Items					
77	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).	0.2	MT			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
78	01CS.6.17	GI Pipe Sleeves - Non FIM Items					
79	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.	0.15	MT			
80	01CS.6.18	MS Chequered Plates - Non FIM Items					
81	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).	1	MT			
82	01CS.6.19	MS Grating Cat. A,B - Non FIM Items					
83	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.	0.25	MT			
84	01CS.6.20	Cold Formed Light guage - Non FIM Items					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
85	01CS.6.20.1	Supplying, fabricating, erecting in position at all levels and locations and testing COLD FORMED LIGHT GAUGE STEEL structural sections of any approved shape for purlins, side girts etc. (manufactured by approved manufacturer) including sag rods, cleats, crook bolts, fixtures, splices/sleeves, bolts, nuts, cutting to required size straightening if required, bolting/ welding of joints, finishing edges by grinding, fixing in line and level with temporary staging and removal of the same after final alignment, preparation and submission of detailed fabrication drawings, preparing the surface for painting and applying shop primer as per EIL Specification No. 6-44-0004 (or Job Specification, wherever applicable) etc. all complete as specified and directed. (SUPPLY OF ALL MATERIALS IN CONTRACTOR'S SCOPE).	13	MT			
86	01CS.6.22	MS Rungs - Non FIM Items					
87	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).	30	kg			
88	01CS.6.23	Hand Railing 1000mm - Non FIM Items					
89	01CS.6.23.3	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 (80-85 micron as per IS:4759, IS:2629, IS: 4736, IS:2633), shop primer (1 coat of P6 of 40 micron) as per Sl. No. 8.1 of Table 8.0 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	50	m			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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).					
90	01CS.6.25	Mechanical Anchor fastners - Non FIM Items					
91	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. "	4	each			
92	01CS.6.26	Chemical Anchor Fastner					
93	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. "	4	each			
94	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	1	each			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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. "					
95	01CS.6.31	Scaffolding System					
96	01CS.6.31.1	Providing and fixing double scaffolding system (cup lock type) on the exterior side, up to & inclusive of 20 m height, made with 40 mm dia M.S. tube 1.5 m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staircase system in the scaffolding for working platform 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. complete as per directions and approval of Engineer-in-charge .The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding.	80	m^2			
97	01CS.10	DEMOLISHING AND DISMANTLING (REFER SPEC NO. 6-68-0012)					
98	01CS.10.1	Brickwork - Non FIM Items					
99	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).	2	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
100	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.	2	m^3			
101	01CS.10.2	RCC - Non FIM Items					
102	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			
103	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.	2	m^3			
104	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).	0.5	m^3			
105	01CS.10.6	Steelwork - Non FIM Items					
106	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,	1	MT			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		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.					
107	01CS.11	MISCELLANEOUS ITEMS (REFER SPECIFICATION NO. 6-68-0013)					
108	01CS.11.1	Antitermite - Non FIM Items					
109	01CS.11.1.1	Providing and injecting approved chemical emulsions as specified for pre-constructional ANTI-TERMITE TREATMENT and creating a chemical barrier under and around column pits, wall trenches, basement excavations, top surfaces of plinth filling, junction of wall and floor, along the external perimeter of building, expansion joints, surrounding of pipes and conduits etc. all complete as specified and directed. (Plinth area of the building at ground floor only shall be measured).	180	m^2			
110	01CS.11.3	Cutting RCC Piles - Non FIM Items					
111	01CS.11.3.1	Cutting the heads of R.C.C. piles of diameter upto 600mm and a length not exceeding 1500mm including exposing/ cleaning, bending of the reinforcement, making site clean for casting of pile cap and removal of debris to the spoil heaps within the plant boundary etc. all complete as specified & directed. (Excavation; if any, to be measured separately under respective item).	100	each			
112	01CS.11.3.3	Cutting the heads of R.C.C. piles of diameter upto 600mm and a length more than 1500 mm but not exceeding 3000mm including exposing/ cleaning, bending of the reinforcement, making site clean for casting of pile cap and removal of debris to the spoil heaps within the plant boundary etc. all complete as specified & directed. (Excavation; if any, to be measured separately under respective item).	26	each			
113	01CS.11.4	Building pile heads - Non FIM Items					
114	01CS.11.4.5	Providing and building up pile heads of diameter upto 600mm in RCC of grade M30 with 20mm and down size graded crushed stone aggregates/ gravel including all	1	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
		shuttering but excluding the cost of reinforcement (to be measured under respective item) all complete as directed.					
115	01CS.11.6	Sand Filling - Non FIM Items					
116	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 .	400	m^3			
117	01CS.11.7	DPC - Non FIM Items					
118	01CS.11.7.2	Providing and laying 40mm thick DAMP PROOF COURSE with plain cement concrete of grade M20 (nominal mix) with 10mm and down size graded crushed stone aggregates and mixing integral water proofing compound (conforming to IS 2645) as per manufacturer's specifications, applying two coats of hot Bitumen (Grade VG10 conforming to IS 73) @ 1.7 kg/sq.m for each coat, on top surface as per specifications including cleaning, watering the top surface of walls, centering, shuttering, placing, tamping, curing, sprinkling an even layer of dry and sharp sand over the hot bitumen etc. all completed as specified and directed.	10	m^2			
119	01CS.11.10	BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE					
120	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.	4000	kg			
121	01CS.14	BONDING FRESH CONCRETE TO OLD CONCRETE BY EPOXY RESIN BONDING SYSTEM (REFER SPECIFICATION NO. 6-68-0056)					

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
122	01CS.14.1	Epoxy Resin - non FIM Items					
123	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).	1	kg			
124	01CS.19	CONCRETE BLOCK MASONRY (REFER SPECIFICATION NO. 6-68-0016)					
125	01CS.19.2	Solid Conc Block (Half) Grade C (5.0) - Non FIM Item					
126	01CS.19.2.1	Providing and laying HALF CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0) in cement mortar 1:4 (1 Cement : 4 Coarse Sand) in any shape, including the cost of materials, labour, scaffolding/ staging, sampling and testing, soaking of blocks, cutting and laying of blocks, providing openings of any shape & size, raking out the joints, supplying and placing 2 Nos. 6 mm dia. mild steel reinforcement 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.	25	m^2			
127	01CS.19.3	Solid Conc Block Grade C (5.0) - Non FIM Item					
128	01CS.19.3.1	Providing and laying CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0), in cement mortar 1:6 (1 Cement : 6 Coarse Sand) in one or more block thickness and in any shape (excluding circular/ curved block masonry) at all depths below & upto plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of blocks, cutting and laying of blocks, 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, filling the blocks with mortar at specified locations, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT	50	m^3			

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S.No	Item No.	Description of Items	Quantity	Unit	Rate in Rupees		Amount
					Figures	Words	
129	01CS.19.3.2	SUPPLIED BY THE CONTRACTOR Providing and laying CONCRETE BLOCK MASONRY with SOLID CONCRETE BLOCKS of Grade C (5.0), in cement mortar 1:6 (1 Cement : 6 Coarse Sand) in one or more block thickness and in any shape (excluding circular/ curved block masonry) at all heights above plinth level including the cost of materials, labour, scaffolding/ staging, sampling & testing, soaking of blocks, cutting and laying of blocks, 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, filling the blocks with mortar at specified locations, embedding the fittings & fixtures, curing, etc. all complete as per specifications. ALL MATERIALS INCLUDING CEMENT SUPPLIED BY THE CONTRACTOR	300	m^3			

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MASTER INDEX
(TECHNICAL PART)

MISC. BUILDING WORKS

TENDER NO. B895-999-81-46-CF-T-8202

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	03.04.26	ISSUED FOR TENDER	BR	SS	GJK

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LIST OF ATTACHMENTS

1.0 SCOPE OF WORK

S. No.	Document No.	Rev. No.	Title
ARCHITECTURE			
1.	B895-999-81-46-SOW-8202	0	Scope of Works & Supply – Architecture
STRUCTURAL			
1.	B895-999-81-41-SOW-8202	A	Scope of Work & Supply – Structural
GENERAL CIVIL			
1.	B895-999-81-45-SOW-8202	A	SCOPE OF WORK & SUPPLY (GENERAL CIVIL)
ELECTRICAL			
1.	B895-999-16-50-SP-8202	A	Job Specification and scope of work (Electrical)
EQUIPMENT DIVISION			
1.	B895-999-80-42-SOW-8202	0	SCOPE OF SUPPLY / WORKS STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)
ITS			
1.	B895-999-20-41-SOW-8202	0	Scope of Work & Supply – ITS
DIGITAL TECHNOLOGY SOLUTIONS			
1	B895-999-92-41-SP-9804	0	SOW & JOB SPECIFICATIONS (Digital Technology Solutions)

2.0 LIST OF EIL SPECIFICATIONS

a. ARCHITECTURE

S. No.	Specification No.	Rev. No.	Title
1	6-75-0001	7	Specification for Architectural Works - General.
2	6-75-0002	7	Specification for floor finishing
3	6-75-0003	7	Specification for wood work
4	6-75-0004	8	Specification for Steel/ Aluminum doors, windows & ventilators
5	6-75-0005	7	Specification for plastering & pointing.
6	6-75-0006	8	Specification for roof treatment.
7	6-75-0007	7	Specification for whitewashing, Colour washing, distempering, Painting & polishing.
8	6-75-0008	7	Specification for roofing.
9	6-75-0009	7	Specification for sanitary fittings and fixtures.
10	6-75-0010	8	Specification for False Ceiling, False Flooring Under deck Insulation & Partitioning
11	6-75-0011	2	Specification for fire check / fire resistant doors, windows & partitions

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12	6-75-0016	0	Standard specification for aluminium composite panel (ACP) cladding system
13	6-75-0017	0	Standard specification for structural glazing system

b. STRUCTURAL

S. No.	Specification No.	Rev.	Title
1	6-68-0001	6	Civil & Structural Works-General scope
2	6-68-0002	7	Civil & Structural Works-Materials
3	6-68-0003	6	Civil & Structural Works-Earthwork
4	6-68-0004	8	Civil & Structural Works-Plain and Reinforced Cement Concrete
5	6-68-0006	8	Civil & structural Works - structural steel works.
6	6-68-0007	8	Civil & structural Works - structural steel Works (Tubular/Hollow Sections).
7	6-68-0008	9	Civil & structural works - miscellaneous steel works
8	6-68-0009	6	Standard specification civil and structural works brick masonry.
9	6-68-0012	6	Civil & structural works – demolition and dismantling.
10	6-68-0013	6	Civil & Structural works-Miscellaneous items
11	6-68-0014	2	Standard specification civil and structural works precast concrete
12	6-68-0016	2	Civil & structural works - Concrete Block Masonry
13	6-68-0017	2	Standard specification civil and structural works bipolar concrete penetrating corrosion inhibiting admixture
14	6-68-0056	5	Standard specification for bonding fresh concrete to old concrete by epoxy resin bonding system.

c. CIVIL & U/G PIPING

S. No.	Specification No.	Rev.	Title
1.	6-65-0006	4	Standard Specification for earthwork for U/G piping
2.	6-65-0027	6	Standard specification for underground and above ground G.I. pipeline system (water services)
3.	6-65-0042	5	Standard Specification for underground sewer system-pre cast R.C.C, pipes
4.	6-65-0053	4	Standard Specification for plumbing and building drainage
5.	6-65-0062	6	Standard specification for acid resisting brick / tile lining
6.	6-66-0004	1	Standard specification for portable fire extinguisher
7.	6-66-0011	5	Standard specification for non-percolating lay flat delivery hose for fire fighting
8.	6-66-0012	5	Standard specification for stand post type fire hydrant (with or without pumper connection)
9.	6-66-0018	5	Standard specification for first aid hose reel
10.	6-66-0038	5	Standard specification for safety shower and eye wash
11.	6-66-0047	4	Standard specification for hose cabinet
12.	6-44-0012	6	Standard specification for fabrication and erection of piping

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13.	6-44-0013	6	Standard specification for inspection, flushing and testing of piping systems
14.	6-44-0074	2	Standard specification for cement lined piping

d. ELECTRICAL

S. No.	Specification No.	Rev.	Title
1	6-51-0008	6	Specification for flameproof lighting and power panels
2	6-51-0012	6	Specification for medium voltage switchboards fixed type for package equipment
3	6-51-0014	6	Specification for industrial type control stations.
4	6-51-0021	6	Specification for flameproof plug socket and hand lamp
5	6-51-0022	1	Specification for grid connected rooftop solar photovoltaic power system
6	6-51-0049	2	Specification for Small MV VFD system
7	6-51-0051	9	Specification for medium and high voltage cables
8	6-51-0052	7	Specification for communication and fire alarm cables.
9	6-51-0061	6	Specification for hazardous area light fixtures and junctions boxes
10	6-51-0064	3	Specification for energy efficient medium voltage induction motors
11	6-51-0081	5	Specification for electrical equipment installation
12	6-51-0082	6	Specification for cable installation
13	6-51-0083	6	Specification for lighting installation
14	6-51-0084	5	Specification for earthing installation
15	6-51-0087	4	Specification for field inspection, testing and commissioning of electrical installations
16	6-51-0093	6	Specification for electrics of package equipment
17	6-51-0099	7	Design philosophy for electrical facilities

e. EQUIPMENT DIVISION

S. No.	Specification No.	Rev.	Title
1	6-61-0017	1	EIL Standard Specification for Air Conditioning System
2	6-41-0003	6	EIL Standard Specification for Centrifugal pumps (Water service)

LIST OF EIL STANDARDS

a. ARCHITECTURE

S. No.	Standard No.	Rev. No.	Title
1.	7-75-0002	6	Skirting detail (with brick wall).

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2.	7-75-0003	6	Skirting detail (with R.C.C. column).
3.	7-75-0004	6	Dado detail (with brick wall & RCC col.)
4.	7-75-0011	6	Wooden flush door (with pressed steel frame)
5.	7-75-0014	6	Glazed Aluminium Door
6.	7-75-0015	6	Glazed Aluminium Window
7.	7-75-0036	7	Pipe hand rail with square up right type.
8.	7-75-0041	6	False ceiling details with aluminium grid.
9.	7-75-0042	6	Aluminium panel false ceiling (84C system).
10.	7-75-0043	6	Aluminium panel false ceiling (tray type).
11.	7-75-0049	3	False flooring
12.	7-75-0051	7	Transformer gate details (upto 6000mm. width).
13.	7-75-0052	6	Transformer gate details (beyond 6000mm. width).
14.	7-75-0054	6	Steel gate (for entrances upto 6.0m width)
15.	7-75-0060	6	Orissa pan W.C. (fixing detail).
16.	7-75-0062	6	European type WC (fixing detail).
17.	7-75-0063	6	Urinal fixing detail.
18.	7-75-0064	6	Wash basin fixing detail.
19.	7-75-0065	6	Plinth protection (with building drain)
20.	7-75-0066	6	Wooden panel door (toilet door)
21.	7-75-0068	6	Roof drainage and waterproofing
22.	7-75-0070	6	Steel Door (Pressed Steel) Single Shutter
23.	7-75-0071	6	Steel Door (Pressed Steel) Double Shutter
24.	7-75-0074	1	Steel Large door (pressed steel) double shutter
25.	7-75-0091	2	Metal sheet (flashing detail)
26.	7-75-0093	2	Stainless steel tubular handrail
27.	7-75-0095	1	Toilet cubicles details
28.	7-75-0097	1	Ramp detail (for wheel chair users)

b. STRUCTURE

S. No.	Standard No.	Rev	Title
1	7-67-0008	8	Pedestal for stair/Ladders
2	7-67-0011	6	Flooring details for buildings
3	7-68-0051	7	Standard lifting hooks in precast slabs & chequered plates.

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S. No.	Standard No.	Rev	Title
4	7-68-0052	8	Details of M.S. rungs for concrete structures.
5	7-68-0056	8	Metal Insert Plate
6	7-68-0060	1	Handrail tube and ball type
7	7-68-0106	8	Standard lap length of bar
8	7-68-0201	7	Standard lugs.
9	7-68-0202	8	Typical grating support
10	7-68-0208	7	Splicing detail for rolled sections
11	7-68-0211	6	Beam to beam & beam to column connection details
12	7-68-0355	4	Instrumentation cable duct / tray supporting arrangement.
13	7-68-0417	9	M.S. Anchor Bolt Assemblies
14	7-68-0501	8	Handrails
15	7-68-0507	9	Details of steel ladder
16	7-68-0509	8	Steel ladder joint details
17	7-68-0625	2	Cable trench inside the buildings
18	7-68-0658	1	Bolted shear connection details for beam to beam
19	7-68-0659	0	Bolted shear connection details for beam with column
20	7-68-0684	5	Monorail fixing details with R.C.C. beam
21	7-68-0689	4	Shear connections welded type - beam to beam
22	7-68-0697	6	Electroforged grating Type I & Type II

c. CIVIL & U/G PIPING

S. No.	Standard No.	Rev	Title
1.	7-65-0001	5	Abbreviations, legends and eqpt. Symbols
2.	7-65-0211	5	Detail of rungs for manholes, valve pits, tanks etc.
3.	7-65-0212	6	Standard miscellaneous details for manholes
4.	7-65-0214	7	Gully trap chamber
5.	7-65-0215	5	Inspection chamber
6.	7-65-0310	5	Detail of neutralization pit
7.	7-65-0412	4	Typ. detail of acid / alkali proof lining.
8.	7-65-0442	4	Detail of rain water harvesting (catchment area ~ 500 sq.m.)
9.	7-65-0443	4	Detail of rain water harvesting (catchment area ~ 1500 sq.m.)
10.	7-65-0444	4	Detail of rain water harvesting (catchment area ~ 3000 sq.m.)

d. ELECTRICAL

S. No.	Standard No.	Rev	Title
1.	7-51-0002	6	Symbols - single line diagrams.
2.	7-51-0011	6	Symbols - wiring diagrams.
3.	7-51-0021	6	Symbols - plans (layout drawings)
4.	7-51-0103	7	Typical earth plate and fixing details.
5.	7-51-0104	6	Typical arrangement for earthing of motor.
6.	7-51-0106	6	Typical earth connection for push button station.
7.	7-51-0115	6	Fence and gate earthing (transformer yard)
8.	7-51-0116	9	Equipment earthing schedule.
9.	7-51-0203	6	Typical installation of open area flood light fixture mounted on wall or column
10.	7-51-0211	6	Post top lantern installed on gate
11.	7-51-0212	6	Typical installation of fluorescent / led fixture mounting in exposed wiring system

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12.	7-51-0213	6	Typical installation of recessed mounted fluorescent / led fixture
13.	7-51-0214	6	Typical installation of recessed mounted or below false ceiling mounted lighting fixture.
14.	7-51-0215	6	Typical installation of recessed mounted lighting fixture block of four.
15.	7-51-0216	6	Typical installation of high bay lighting fixture
16.	7-51-0217	6	Typical installation of well glass lighting fixture (safe area)
17.	7-51-0218	6	Typical installation of bulkhead lighting fixture
18.	7-51-0219	6	Typical installation of dispersive reflector fixture
19.	7-51-0221	6	Typical installation of hazardous area well glass / dome glass / flat glass lighting fixture
20.	7-51-0222	6	Typical installation of hazardous area bulk ¿ head fixture
21.	7-51-0223	6	Typical installation of flood light fixture
22.	7-51-0224	6	Typical installation of weather proof light fixture
23.	7-51-0225	6	Typical installation of flame proof lighting / power panel
24.	7-51-0226	6	Typical installation of lighting / power panel wall (surface) mounted
25.	7-51-0229	6	Typical Installation of Lighting fixture mounting in concealed conduit system
26.	7-51-0230	6	Typical installation of lighting / power panel flush mounted
27.	7-51-0232	5	Typical installation of metsec channel and lighting fixture
28.	7-51-0233	1	Typical installation of ground level lighting fixture with precast foundation
29.	7-51-0236	1	Typical details of switchbox / conduit for lighting switches / MCP / FCS in blast proof wall
30.	7-51-0303	7	Typical section of RCC cable trench
31.	7-51-0305	6	Installation details for conduit or cable support on wall / slab / beam
32.	7-51-0313	6	Connection details for horizontal motor (cable below ground)
33.	7-51-0314	6	Connection details for motor and control station (cable in tray)
34.	7-51-0315	6	Installation details for socket / receptacle mounted on wall / column (cable below ground)
35.	7-51-0316	6	Installation details for socket / receptacle mounted on column (cable in tray)
36.	7-51-0317	6	Installation details for socket / receptacle / control station mounted on hand rail
37.	7-51-0332	4	Safety measures for electrical installations during construction
38.	7-51-0333	4	Details for hot dip galvanized ladder type cable trays
39.	7-51-0336	4	Typ. installation details of electrical panels on cable trench

e. EQUIPMENT DIVISION

S. No.	Standard No.	Rev	Title
1	7-76-0103	2	Instruction to vendors for site performance guarantee requirement

3.0 DATA SHEETS

a. GENERAL CIVIL

S. No.	Document No.	Rev.	Title
1.	B895-999-81-45-8011	2	Data sheet for Landing Valve (stand post type fire hydrant)
2.	B895-999-81-45-8012	1	Data sheet for Hose Reel

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3.	B895-999-81-45-8013	0	Data sheet for Hose Cabinet
4.	B895-999-81-45-8021	A	Data sheet for Air Release Valve

b. ELECTRICAL

S. No.	Document No.	Rev.	Title
1.	B895-000-16-50-DS-8301	B	Datasheet for Lighting fixture schedule
2.	B895-000-16-50-DS-0802	A	Datasheet for safe area LP/PP
3.	B895-000-16-50-DS-1201	A	Datasheet for MV Switchboard fixed type
4.	B895-000-16-50-DS-1211	A	Hardware datasheet for PDB Incomer
5.	B416-000-16-50-DS-1804	B	Hardware datasheet for PDB Incomer with ACB
6.	B895-000-16-50-DS-1811	B	Hardware datasheet for Contactor controlled motor feeder up to 55 KW
7.	B895-000-16-50-DS-1813	A	Hardware Datasheet for MCCB Contactor Feeder
8.	B895-000-16-50-DS-1802	A	Datasheet for MV Switchboard component
9.	B895-000-16-50-DS-3801	B	Data Sheet- MV VFD (for motors >55kW & <=160kW)
10.	B895-000-16-50-DS-4901	B	Data Sheet- MV VFD (for motors <= 55kW)
11.	B895-000-16-50-DS-4902	A	Typical SLD for VFD with bypass (Motor rating up to 55kW)
12.	B895-000-16-50-DS-6401	B	Datasheet for MV Induction Motor – DOL
13.	B895-000-16-50-DS-9901	A	Datasheet for Electrical Load Data
14.	B895-000-16-50-DS-5102	A	Data Sheet for MV power Cable
15.	B895-000-16-50-DS-5201	A	Data Sheet for Paired Control Cables
16.	B895-000-16-50-DS-5202	A	Data Sheet for Communication & Fire Alarm Cables

c. EQUIPMENT DIVISION

S. No.	Document No.	Rev	Title
1	B895-999-80-42-DS-8202-01	0	DATA SHEET FOR AIR HANDLING UNIT (AHU)
2	B895-999-80-42-DS-8202-02	0	DATA SHEETFOR FINE FILTER
3	B895-999-80-42-DS-8202-03	0	DATA SHEET FOR CHEMICAL FILTER UNIT
4	B895-999-80-42-DS-8202-04	0	DATA SHEET FOR WATER COOLED CHILLER
5	B895-999-80-42-DS-8202-05	0	DATA SHEET FOR CHILLED WATER RE-CIRCULATION PUMP

4.0 VENDOR DATA REQUIREMENTS

a. ELECTRICAL

S. No.	Document No.	Rev.	Title
1	B895-999-16-50-VR-8202	A	Vendor data requirement for Electrics of Building tender works

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b. GENERAL CIVIL

S. No.	Document No.	Rev.	Title
1	B895-999-81-45-VDR-8202	A	VDR for General Civil works

c. EQUIPMENT DIVISION

S. No.	Document No.	Rev.	Title
1	B895-999-80-42-VDR-8202	0	VENDOR DATA REQUIREMENT STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)

d. MISCELLANEOUS

S. No.	Document No.	Rev.	Title
1	B895-999-06-45-VDR-8202	A	VENDOR DATA REQUIRMENT (Cathodic Protection)

5.0 JOB SPECIFICATION

S. No.	Document No.	Rev	Title
1	B895-999-80-42-SP-8202	0	JOB SPECIFICATION STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)
2	B895-999-6-45-CPS-8201	0	CP SYSTEM SPECIFICATION

6.0 LIST OF INSPECTION TEST PLAN (ITP)/ QUALITY DOCUMENTS

S. No.	ITP NUMBER	Rev.	Title
1	6-78-0001	3	Specification for quality management system requirements from bidders
2	6-78-0002	3	Specification for documentation requirements from contractors
3	6-78-0003	3	Specification for documentation requirements from suppliers
4	6-82-0001	2	Standard specification for health, safety & environment (HSE) management at construction sites
5	6-82-1010	3	Inspection & Test Plan (ITP) for incoming material checking for contractor's supplied materials
6	6-82-3100	2	Inspection & test plan (ITP) for civil, structural &architectural works (item rate contracts – with categorization)
7	6-82-6100	4	Standard quality assurance plan construction division (item rate contracts)
8	6-81-0038	5	Inspection & Test Plan for Pump Centrifugal Horizontal (General Water Service)
9	6-81-0154	2	Inspection and Testing Plan for air conditioning package
10	6-81-1008	4	Inspection and test plan for flameproof lighting and power panels
11	6-81-1012	3	Inspection and test plan for MV fixed type switch board for package equipment

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12	6-81-1014	4	Inspection and test plan for industrial type control station
13	6-81-1021	3	Inspection and test plan for flameproof plugs, sockets and hand lamps
14	6-51-1038	3	Inspection and Test Plan for for Small MV VFD system
15	6-81-1051	4	Inspection and Test Plan for MV and HV cables and accessories
16	6-81-1052	4	Inspection and Test Plan for communication and fire alarm cables
17	6-81-1061	4	Inspection and test plan for hazardous area lighting fixture and junction boxes
18	6-81-1064	1	Inspection and test plan for energy efficient medium voltage motors

7.0 DRAWINGS

S. No.	Drawing No	Rev	Title
1	B895-999-81-45-00002	C	Complex Limit of BPCL Kochi Refinery
2	B895-999-81-46-12411	D	Substation – JU1 + Satellite Rack Room (SRR) - 12
3	B895-999-81-46-12412	C	Substation – JU1 + Satellite Rack Room (SRR) - 12
4	B895-999-81-46-12413	B	Substation – JU1 + Satellite Rack Room (SRR) - 12
5	B895-999-81-46-12414	B	Substation – JU1 + Satellite Rack Room (SRR) - 12
6	B895-999-81-46-12415	A	Substation – JU1 + Satellite Rack Room (SRR) - 12

8.0 MISCELLANEOUS

a. VENDOR LIST

S. No.	Document No.	Rev.	Title
1	B895-999-81-46-LL-8202	0	APPROVED VENDOR LIST (ARCHITECTURAL)
2	B895-999-81-41-LL-8202	A	APPROVED VENDOR LIST (STRUCTURAL)
3	B895-999-81-45-LL-8201	A	Approved Vendor List
4	B895-999-80-42-VL-8202	0	VENDOR LIST STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)
5	B895-999-16-50-VL-8202	A	Vendor list for Electrical equipment's & components
6	B895-999-06-45-VL-02	A	Vendor List (Cathodic Protection)

b. MISCELLANEOUS LIST

S. No.	Document No.	Rev.	Title
1	EIL PMS	0	Piping Material Specification
2	B895-999-80-42-SL-8202	0	MANDATORY SPARES LIST STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)
3	B895-999-80-42-TCL-8202	0	TECHNICAL CONFIRMATION LIST STATIC & MACHINERY EQUIPMENT (PACKAGED EQUIPMENT)
4	B895-000-69-41-SP-0002	1	PROCEDURE FOR SMART INTEGRATED ENGG. & DIGITAL HANDOVER FOR DRAWING/DOCUMENT/ TRACKING

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SCOPE OF SUPPLY AND WORK (ARCHITECTURE)

TENDER NO. B895-999-81-46-CF-T-8202

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	03.04.26	ISSUED FOR TENDER	KT	SS	GJK

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CONTENTS

1. SCOPE OF WORK
2. SCOPE OF SUPPLY
3. LIST OF ATTACHMENTS
4. 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 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

Scope of work of the Contractor shall include (but not limited to) the buildings and/or Sheds as listed below as per Schedule of Rates (S.O.R), Standard Specifications and Engineering Standards included in the Tender

- Substation – JU1 + Satellite Rack Room (SRR) – 12
- Other Miscellaneous building works

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, Paneling, partitioning, 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 procurement, transportation, storage, fabrication, installation and execution etc.) of all materials (consumables and non-consumables), products and all steel structures and its related accessories labor, 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.

Note: Supply, procurement, transportation, fabrication and erection and installation and construction of all building super structure steel roof work and its related accessories (gutters, rainwater down take pipes etc. all complete) is in the scope 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, Doors and Windows, 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 the Tender document.

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.

All items in the S.O.R. shall be inclusive of all material, labour, constructional infrastructures like scaffolding/ staging, finishing, cleaning, cutting chases/ holes etc. in brick work/ RCC work/ super structural steel works and making good the same and rectification of any damaged work shall be applicable for all heights and locations.

2.0 SCOPE OF SUPPLY

2.1 Owner’s Scope of Supply

Nil

2.2 Contractor’s Scope of Supply

All materials (consumables & non-consumables), tools tackles etc. as required for satisfactory completion of the job shall be supplied by the contractor.

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All material shall be of approved brand/ make as per the list of approved brand/ vendors for architectural 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.

3.0 LIST OF ATTACHMENTS

3.1 DRAWINGS

S. No	Drawing No.	Title
1	B895-999-81-46-12411	Substation – JU1 + Satellite Rack Room (SRR) - 12
2	B895-999-81-46-12412	Substation – JU1 + Satellite Rack Room (SRR) - 12
3	B895-999-81-46-12413	Substation – JU1 + Satellite Rack Room (SRR) - 12
4	B895-999-81-46-12414	Substation – JU1 + Satellite Rack Room (SRR) – 12
5	B895-999-81-46-12415	Substation – JU1 + Satellite Rack Room (SRR) – 12

3.2 STANDARD SPECIFICATIONS

S. No.	Specification No.	Rev. No.	Title
1	6-75-0001	7	Specification for Architectural Works - General.
2	6-75-0002	7	Specification for floor finishing
3	6-75-0003	7	Specification for wood work
4	6-75-0004	8	Specification for Steel/ Aluminum doors, windows & ventilators
5	6-75-0005	7	Specification for plastering & pointing.
6	6-75-0006	8	Specification for roof treatment.
7	6-75-0007	7	Specification for whitewashing, Colour washing, distempering, Painting & polishing.
8	6-75-0008	7	Specification for roofing.
9	6-75-0009	7	Specification for sanitary fittings and fixtures.
10	6-75-0010	8	Specification for False Ceiling, False Flooring Under deck Insulation & Partitioning
11	6-75-0011	2	Specification for fire check / fire resistant doors, windows & partitions

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12	6-75-0016	0	Standard specification for aluminium composite panel (ACP) cladding system
13	6-75-0017	0	Standard specification for structural glazing system

3.3 STANDARDS

S. No.	Standard No.	Rev. No.	Title
1.	7-75-0002	6	Skirting detail (with brick wall).
2.	7-75-0003	6	Skirting detail (with R.C.C. column).
3.	7-75-0004	6	Dado detail (with brick wall & RCC col.)
4.	7-75-0011	6	Wooden flush door (with pressed steel frame)
5.	7-75-0014	6	Glazed Aluminium Door
6.	7-75-0015	6	Glazed Aluminium Window
7.	7-75-0036	7	Pipe hand rail with square up right type.
8.	7-75-0041	6	False ceiling details with aluminium grid.
9.	7-75-0042	6	Aluminium panel false ceiling (84C system).
10.	7-75-0043	6	Aluminium panel false ceiling (tray type).
11.	7-75-0049	3	False flooring
12.	7-75-0051	7	Transformer gate details (upto 6000mm. width).
13.	7-75-0052	6	Transformer gate details (beyond 6000mm. width).
14.	7-75-0054	6	Steel gate (for entrances upto 6.0m width)
15.	7-75-0060	6	Orissa pan W.C. (fixing detail).
16.	7-75-0062	6	European type WC (fixing detail).
17.	7-75-0063	6	Urinal fixing detail.
18.	7-75-0064	6	Wash basin fixing detail.
19.	7-75-0065	6	Plinth protection (with building drain)
20.	7-75-0066	6	Wooden panel door (toilet door)
21.	7-75-0068	6	Roof drainage and waterproofing
22.	7-75-0070	6	Steel Door (Pressed Steel) Single Shutter
23.	7-75-0071	6	Steel Door (Pressed Steel) Double Shutter

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24.	7-75-0074	1	Steel Large door (pressed steel) double shutter
25.	7-75-0091	2	Metal sheet (flashing detail)
26.	7-75-0093	2	Stainless steel tubular handrail
27.	7-75-0095	1	Toilet cubicles details
28.	7-75-0097	1	Ramp detail (for wheel chair users)

3.4 SCHEDULE OF RATES

B895-999-81-46-CF-SOR-8202

3.5 VENDOR LIST

S. No.	Document No.	Rev. No.	Title
1.	B895-999-81-46-LL-8202	0	List of Approved Manufactures of Architectural Products.

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/ drawings, quality of material, mode of measurement, necessary testing etc.

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.

4.4 Quantities of the items are not final and may vary, actual executed quantities 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 reserves the right to choose any of the approved make/ vendors as per the vendor or Manufacturer’s list.

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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, 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 Owner/ PMC 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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SCOPE OF WORK & SUPPLY (STRUCTURAL)

FOR

MISCELLANEOUS BUILDING WORKS FOR PP PROJECT
(TENDER No. B895-999-81-46-CF-T-8202)

PROJECT : POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY

OWNER : BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PMC / EPCM : ENGINEERS INDIA LIMITED (EIL)

JOB NO. : B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	24.02.2026	ISSUED FOR BIDS	HKV	RM	RM

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CONTENTS

SL. No.	Title	Page No
1.	SCOPE OF WORK	3
2.	SCOPE OF SUPPLY	5
3.	SPECIFIC REQUIREMENTS TO BE FULFILLED BY THE CONTRACTOR	5
4.	LIST OF ATTACHMENTS	8
5.	ADDENDUM TO STRUCTURAL SPECIFICATIONS & SOR	10
6.	PREAMBLE TO SCHEDULE OF QUANTITIES	10
7.	SCHEDULE OF RATES	11

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1.0 SCOPE OF WORK

The scope of the work in general shall include the construction of all civil & structural works for Buildings & all associated works.

The scope for work has been elaborated in detail in subsequent sections of this document as well as respective schedule of rates.

Contractor shall visit the sites 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 structures including following but not to be limited to the same:

- SS JU-1 & SRR-12 (Substation cum SRR building)
- Miscellaneous building works

Major Civil Structural works shall include following but not limited to the same.

1.1 Obtaining all approvals/permits 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.

1.2 Earthwork excavation including dewatering, if required, below ground level for all types of soils including soft and hard rock and providing shoring & shuttering, wherever required, by open & close timbering method. Royalty payment for excavation items, if any, shall be in contractor's scope.

1.3 Backfilling at all depths with selected and approved earth available from excavated soil and transportation & disposal of surplus earth and debris (including rock material) inside the plant with due approval of Engineer–in–Charge.

1.4 PCC work including lean concrete at all depths below foundations of all types, plinth beams, walls, non-suspended slabs, trenches, pits etc., and in screed at all depths below plinth level.

1.5 PCC works including lean concrete in screed at all heights above plinth level.

1.6 RCC works in sub-structures for foundation of all types, Pile-caps, plinth beams, walls, non-suspended floor slabs, etc. at all heights, trenches, pits etc. at all depths, including preparation of detailed bar bending schedule and supplying and placing of reinforcement in position as shown in the drawing.

1.7 RCC works in super-structures at all elevations, columns, beams, walls, floor & roof slabs, etc. at all heights, including preparation of detailed bar bending schedule and supplying and placing of reinforcement in position as shown in the drawing.

1.8 Centering & shuttering (including curved shuttering) in sub-structure at all depths and in super-structure at all stages/heights/ elevations at different stages of concreting.

1.9 Fixing of bitumen impregnated fiber board conforming to IS: 1838 of approved quality in expansion joints at all locations and levels in concrete structures.

1.10 Sealing of expansion joints at all locations and levels in Concrete Structures with poly-sulphide sealing compound as per IS: 12118 including raking of joints etc.

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1.11 Structural steel works with rolled steel, parallel flange, built-up sections, Tubular / Hollow sections and Cold formed light gauge sections including fabrication, erection and preparation of detailed fabrication drawings along with calculations for all types of structures at all locations and heights in super-structure.

1.12 Providing and fixing profiled, precoated, zincalume/ Galvalume steel sheets including corner flashing, polycarbonate sheets and all other accessories for sheds.

1.13 Concrete block masonry with Solid concrete blocks in substructure and superstructure for all depths and heights as per specifications.

1.14 Curing of RCC works at all depths below plinth level and all heights above plinth level as per specification.

1.15 Surface preparation, painting of primer and final coat for all structural steel wherever mentioned shall be as per Job Specification No. B895-000-06-42-PLS-01.

1.16 Providing and fixing electro-forged hot dipped galvanized MS grating as per EIL std. 7-68-0697 as per requirement at respective locations and providing and fixing handrails as per EIL Std 7-68-0501 & 7-68-0060, wherever required.

1.17 Fabrication & placing/ erection of miscellaneous steel items like Anchor Bolts, Metal Insert Plates, Pipe Sleeves, Anchor Fasteners, Rungs, Hand railing, etc. as per EIL standards & specifications as directed by Engineer-in-charge at any location wherever required.

1.18 Miscellaneous Structural Steel Works including Handrails, Gratings, Inserts, Chequered Plates, Chemical and Mechanical Anchors, etc.

1.19 Miscellaneous works for Sand filling (with manufactured sand), DPC etc. at all locations as specified.

1.20 Dismantling/Demolishing of PCC/RCC, masonry work etc. for all depths below plinth level and all heights above plinth level

1.21 Dismantling and re-erecting of steel structures wherever required.

1.22 Providing anchor fasteners to fix structures/ pipe supports etc. on existing pavement/ foundations/ structure.

1.23 Preparation of fabrication drawings along with calculations based on the GA drawings furnished to the contractor and getting the same reviewed as per specifications.

1.24 Providing & fixing MS chequered plates at all heights on structures wherever required.

1.25 Compacting the sub-grade/ foundation beds at all depths as per the direction of Engineer-In-Charge before placing of foundations.

1.26 RCC works for precast cover of drains and trenches etc.

1.27 Preparation of detailed fabrication drawings using TEKLA 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 owner. Final model shall be submitted for records which shall include all fabrication drawing, related files, catalogues along with all erection/ part marks and material reports.

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1.28 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 and soft copy to Engineer-in-charge as specified elsewhere in this Bid package.

1.29 Removal of scrap, generated during construction, including segregation of scrap into serviceable and unserviceable material and transportation of serviceable material to Owner's storage.

1.30 Clearing and removal of debris including 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.

1.31 Cutting of Pile head including exposing, cleaning and bending of reinforcement etc. has been considered.

1.32 Building of Pile head including shuttering has been considered.

1.33 Any other Civil-Structural work as specified in respective scopes of work of General Civil, Architectural, Electrical and Instrumentation Works.

1.34 Contractor shall make his own arrangement for casting precast element inside the Plant boundary.

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

2.1 OWNER'S SCOPE OF SUPPLY: NIL

2.2 CONTRACTOR'S SCOPE OF SUPPLY: Procurement and supply of all material (consumables/ non-consumables) required for the execution of Civil Structural works including dismantling works providing temporary formwork and scaffolding 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 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.

2.3 For list of approved products for use in Civil-Structural works refer Document No. B895-999-81-41-LL-8202 enclosed with the tender document.

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 foundation can be taken up after due approval of Engineer-in-Charge.

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3.2 Installation of weigh batching plant of adequate capacity for concrete along with transit mixers and concrete pumps as per the direction of Engineer-in-Charge.

3.3 Approved location inside plant for disposal of surplus earth, debris & rock to be identified by the contractor as per the direction of Engineer-in-Charge.

3.4 Structural concrete mix shall be approved Design Mix M30 Grade.

3.5 Generally, the use of one of the following cements shall be considered,

- 43/53 Grade Ordinary Portland cement as per IS:269
- Portland Slag cement conforming to IS:455.
- Portland Pozzolona Cement (PPC, Fly ash based) conforming to IS:1489 Part-1.
- Portland Pozzolona (PPC Calcined clay based) conforming to IS:1489 Part-2.
- Sulphate resistant Portland cement conforming to IS:12330 (For specific requirement as specified in respective drawings).

3.6 The exposure condition for the tender shall be considered as severe.

3.7 Concrete grade for lean concrete below foundation shall be 1:4:8 (Nominal Mix). 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
Severe	Plain concrete	M20	250	0.5
	Reinforced concrete	M30	320	0.45

However minimum cement content, type of cement and any remedial actions required for foundations due to aggressiveness of sub-soil conditions shall be as per Geo-technical report.

3.8 Cup-lock type scaffold systems shall be used for construction. All temporary approaches shall be with scaffolding staircases of min. 750 mm walkway, min. 230 mm tread and max. 200 mm rise of each step.

3.9 Ready Mix concrete shall be used for concreting.

3.10 Supply & filling of Sand Gravel mix & Sand filling (manufactured sand) in all types of foundations.

3.11 High Strength deformed steel bars (TMT) of Grade Fe500D and confirming to IS: 1786 shall be used for all RCC structure.

3.12 Bonding fresh concrete to the old concrete by epoxy resin bonding system (as per EIL specification 6-68-0056) where ever required.

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3.13 Fabrication of anchor bolts shall be taken up on priority to ensure placement of the same at the time of concreting.

3.14 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.

3.15 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.

3.16 Fabrication of structure steel shall be done in contractor's fabrication shop inside plant. Columns and beams shall be fabricated separately and transported to site, where they shall be erected using erection bolts. The quoted rate shall be inclusive of the same. No extra claim will be entertained on a later date on account of the same.

3.17 Structural steel shall be of grade E350 BR/B0 confirming to IS: 2062. Tubular/hollow steel sections shall be of Grade Yst310 conforming to IS:1161/4923. Cold formed light gauge sections shall conform to IS:801. For steel structures, field welding shall be minimized by employing modular construction to the extent possible. Also, contractor to propose modular construction philosophy along with the list of structures that are proposed to be erected in modules, at the time of kick off meeting.

3.18 For steel structures, welded connections shall be adopted during shop fabrications, except where bolted connections are required. All site/field connections shall be bolted.

3.19 Connection Bolts shall be High Strength Structural Steel (Hot Dip Galvanized) Bolts of Property Class 8.8 conforming to IS:3757 & IS:4000. Hexagonal Nuts shall conform to IS:6623. Washers shall conform toIS:6649.

3.20 Structural connections shall have minimum two bolts of 16mm diameter, unless otherwise limited by the size of members.

3.21 All anchor bolt sleeves/pockets and spaces under column bases, shoe plates etc. Shall be grouted with free flow, non-shrink (pre-mix type) grout with 28-day minimum cube crushing strength of 40N/sqmm.

3.22 All lugs shall be of high strength deformed bars of minimum grade Fe500D conforming to IS: 1786.

3.23 All inserts/ sleeves shall be properly secured in position before pouring concrete.

3.24 Metal insert plates shall be of grade E250 Quality BR/B0 confirming to IS: 2062.

3.25 Dewatering including supply of pump wherever required shall be carried out by the contractor at his cost.

3.26 During the performance of the work, the contractor, at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise

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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.

3.27 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

3.28 Work permit system to be followed for each activity. Each activity to be carried out after obtaining work permit on day to day basis. Contractor shall obtain work permit for working inside refinery plant, permit for working at height, Hot work permits and various other permits as applicable & governed by the rules of the refinery etc.

3.29 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.

3.30 The contractor shall ensure proper co-ordination / co-operation with other agencies, while working in the area, without affecting others work front areas.

3.31 Proper management of loose earth, mud, water is to be ensured to avoid making area messy and slippery. Necessary arrangement shall be made to avoid water and mud ingress to OWS/CRW/CBD system.

3.32 The contractor shall ensure that no damage of any kind is done during work execution. In case of any damage done by the contractor the same shall to be rectified at his own cost & time.

4.0 LIST OF ATTACHMENTS

4.1 SPECIFICATIONS: -

Sl. No	Specification No.	Rev. no.	Title of Document
1.	6-68-0001	6	Civil & Structural Works-General scope
2.	6-68-0002	7	Civil & Structural Works-Materials
3.	6-68-0003	6	Civil & Structural Works-Earthwork
4.	6-68-0004	8	Civil & Structural Works-Plain and Reinforced Cement Concrete
5.	6-68-0006	8	Civil & structural Works - structural steel works.
6.	6-68-0007	8	Civil & structural Works - structural steel Works (Tubular/Hollow Sections).
7.	6-68-0008	9	Civil & structural works - miscellaneous steel works
8.	6-68-0009	6	Standard specification civil and structural works brick masonry.

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Sl. No	Specification No.	Rev. no.	Title of Document
9.	6-68-0012	6	Civil & structural works – demolition and dismantling.
10.	6-68-0013	6	Civil & Structural works-Miscellaneous items
11.	6-68-0014	2	Standard specification civil and structural works precast concrete
12.	6-68-0016	2	Civil & structural works - Concrete Block Masonry
13.	6-68-0017	2	Standard specification civil and structural works bipolar concrete penetrating corrosion inhibiting admixture
14.	6-68-0056	5	Standard specification for bonding fresh concrete to old concrete by epoxy resin bonding system.

4.2 STANDARDS: -

Sl. No	Standard No.	Rev. no.	Title of Document
1.	7-67-0008	8	Pedestal for stair/Ladders
2.	7-67-0011	6	Flooring details for buildings
3.	7-68-0051	7	Standard lifting hooks in precast slabs & chequered plates.
4.	7-68-0052	8	Details of M.S. rungs for concrete structures.
5.	7-68-0056	8	Metal Insert Plate
6.	7-68-0060	1	Handrail tube and ball type
7.	7-68-0106	8	Standard lap length of bar
8.	7-68-0201	7	Standard lugs.
9.	7-68-0202	8	Typical grating support
10.	7-68-0208	7	Splicing detail for rolled sections
11.	7-68-0211	6	Beam to beam & beam to column connection details
12.	7-68-0355	4	Instrumentation cable duct / tray supporting arrangement.
13.	7-68-0417	9	M.S. Anchor Bolt Assemblies
14.	7-68-0501	8	Handrails
15.	7-68-0507	9	Details of steel ladder
16.	7-68-0509	7	Steel ladder joint details
17.	7-68-0625	2	Cable trench inside the buildings
18.	7-68-0658	1	Bolted shear connection details for beam to beam

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Sl. No	Standard No.	Rev. no.	Title of Document
19.	7-68-0659	0	Bolted shear connection details for beam with column
20.	7-68-0684	5	Monorail fixing details with R.C.C. beam
21.	7-68-0689	4	Shear connections welded type - beam to beam
22.	7-68-0697	6	Electroforged grating Type I & Type II

4.3 OTHER DOCUMENTS: -

Sl. No	Document No.	Rev.	Pages	Title of Document
1.	B895-999-81-41-LL-8202	A	6	List of Approved Products for use in Civil-Structural works

5.0 ADDENDUM TO STRUCTURAL SPECIFICATIONS & SOR: -

5.1 Wherever in the bid document “sand” is mentioned, the same shall be read as “Manufactured sand of grading equivalent to sand conforming to IS:383”.

5.2 Wherever in the bid document “Fe500” is mentioned, the same shall be read as “Fe500D”.

5.3 Wherever in the bid document EIL Std Spec 6-79-0020 is mentioned, the same shall be read as Job Spec No. B895-000-06-42-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.

6.2 The maximum approximate height of structures shall be 25m (This data is for general guidance of the Contractors; however, deviation from the noted height shall not form a basis for any extra claim).

6.3 As per Geotech report, ground water table is at FGL 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.

6.4 All excavation, backfill & transportation shall be done in soil (for all types) & hard rock only, as detailed in schedule of rate. Excavation, backfill & transportation, done in other than soil & hard rock shall strictly be paid under soil only.

6.5 Item description provided in Schedule of Rates (Short Description) is in brief, while quoting and filling the rate in this 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

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mentioned in item description of Schedule of Rates (Detailed), scope of work, specifications, standards etc. & stringent of all shall govern.

6.6 Wherever “plant boundary/ plant limit” is mentioned in the SOR or specifications, the same shall be read as “Plant Property Limit”.

6.7 Wherever Blended cement as specified is in use, special precautions shall be taken for the curing of the executed concrete works.

7.0 SCHEDULE OF RATES

Sl. No	SOR No.	Rev	SOR Title
1	B895-999-81-41-CF-SOR-8202-0	0	Schedule of Rates for Misc. Building Works for PP Project

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SCOPE OF WORK & SUPPLY (GENERAL CIVIL)

MISC. BUILDING WORKS FOR PP PROJECT BPCL KOCHI

PROJECT : **PMC& EPCM SERVICES FOR PPU & REVAMP OF PRFCC AT BPCL KOCHI REFINERY**

OWNER : **BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**

CONSULTANT : **ENGINEERS INDIA LIMITED (EIL)**

JOB NO : **B895**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	06.03.2026	ISSUED FOR BIDS	LP	AK	AK

CONTENTS

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1. SCOPE OF WORK 3

1.1 BROAD SCOPE OF WORK 3

2. SCOPE OF SUPPLY 5

2.1 OWNER'S SCOPE OF SUPPLY 5
2.2 CONTRACTOR'S SCOPE OF SUPPLY 5

3. ADDENDUM TO STANDARD AND SPECIFICATIONS 5

4. SPECIFIC REQUIREMENTS TO BE FULFILLED BY THE CONTRACTOR 6

5. PREAMBLE TO SCHEDULE OF RATES 6

6. LIST OF ATTACHMENTS 7

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1. SCOPE OF WORK

The General Civil scope of work envisaged under this tender broadly covers the plumbing works, septic tank, upflow anaerobic filter and other associated works, supply & Installation of fire extinguishers, landing valves, hose reel, hose cabinet, cement lining in carbon steel pipe as per PMS, fabrication & laying of carbon steel pipes and other associated works to be carried out in proposed areas required for PPU Project of BPCL Kochi Refinery complex limit owned by BPCL as per standards, specifications, drawings, codes (latest revision), good engineering practices and directions of Engineer-in- charge etc. complete.

The scope of work envisaged under this tender covers the following as per schedule of rate, specifications, drawings, codes, standards and good engineering practices etc. complete. 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. In general, the scope of work shall be as follows but not limited to the same.

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. BROAD SCOPE OF WORK

The detailed scope of work shall be in general but not limited to the following:

2.1 Earthwork in excavation including dewatering below ground level for all types of soil for manholes, neutralization pits, gully trap, inspection chamber or any other place as directed by Engineer-in-charge.

2.2 Backfilling with available good earth and disposal of surplus earth including transportation, stacking of serviceable material anywhere inside the complex and disposal of unserviceable material to demarcated area anywhere inside the plant boundary limit all complete as per specification, drawings, documents and directions of engineer-in-charge.

2.3 Providing and laying brick masonry with locally available bricks of specified class.

2.4 Preparation of internal building plumbing and sanitary piping layouts for building as per National Building Code/ Relevant IS codes and getting the same approved by Owner/ PMC.

2.5 Supplying and laying carbon steel galvanized pipes as per piping materials specification Class J2A underground including supply of all necessary fittings as per specifications, drawings and directions of Engineer-in-Charge.

2.6 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, including all CPVC plain & brass threaded fittings, this includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge.

2.7 Providing & fixing Gully Trap as per standard and drawing.

2.8 Supplying and fixing approved quality UPVC Floor Trap with CP pressed steel grating as per IS: 14735

2.9 Supplying, laying and jointing of underground approved quality UPVC pipes to be used for soil and waste discharge application inside buildings confirming to IS:13592 (Type-B) and

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fittings confirming to IS: 14735 including solvent welded jointing and testing as per IS: 7634 (Part-3), as per drawings, specifications and directions of Engineer-in-Complete.

2.10 Supplying, jointing & laying of underground RCC Class P1 piping for Sanitary Sewer (Gravity flow) including construction of Manholes including grouting etc. complete.

2.11 Supplying & providing Rungs for manholes, valve pit etc.

2.12 Supplying and fixing in position medium/ heavy duty CI manhole frame with lugs and cover.

2.13 Miscellaneous civil works include supplying and laying of RCC pipe for sanitary sewer, UPVC pipe etc.

2.14 Construction, supplying, installation, testing and commissioning of septic tank & Upflow Anaerobic filter.

2.15 Construction of rain water recharging well as per EIL standard drawings, specifications and directions of Engineer-in-charge.

2.16 Supply and laying of unglazed vitreous acid resisting tiles confirming to IS: 4457.

2.17 Supply & erection of safety shower & eyewash as per EIL standard drawings, specifications and directions of Engineer-in-charge.

2.18 Transportation of all piping items from owner's storage Point to work site/workshop, Fabrication and Erection of piping (above ground) for Fire water line.

2.19 Transportation of all piping items from owner's storage point to work site/workshop, including providing internal cement lining on pipes and specials as per specification for cement lining, fabrication including cutting, edge preparation

2.20 Painting of A/G pipes and valves as per painting specification, drawings and direction of Engineer-in-Charge.

2.21 Transportation of all kind of valves (including special and motor operated valves) from owner's storage point to contractor's store/ work site and installation of valves.

2.22 Supply, installation, testing and commissioning of firefighting equipment Double headed landing valve, First Aid hose reel wall mounted type and Hose box cabinet Type-II 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.

2.23 Supply and installation of portable DCP (Dry Chemical Powder Type) extinguisher of 6 kg, Portable CO2 extinguisher of 4.5 kg & clean agent extinguisher.

2.24 Supply and installation of an Air release valve in the piping network, as per the datasheet attached to the tender, as per the standards, specifications, and directions of the Engineer in Charge.

2.25 Clearing and removal of debris includes clearing the site of all unserviceable material from the site after completion of work, as directed by Engineer- in- charge.

2.26 All works shall be done to the entire satisfaction and directions of the Engineer-in-Charge, including clearing of site after completion of work.

2.27 Obtaining all approvals from owner, statutory authorities such as Factory Inspector, Local Municipal or Development Authorities (including existing refinery) and other designated authorities etc. SPCB approval for the C&D waste management at the site for all the C&D waste generated at the site shall be taken by the CONTRACTOR.

2.28 The Contractor shall ensure compliance to the C&D waste management Rules 2016. All the C&D waste generated at the site shall be deposited at collection center so made by the local body or handover it to the authorized processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste

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so as to prevent obstruction to the traffic or the public or drains. All the cost/ charges/ towards the same shall be borne by the CONTRACTOR. The CONTRACTOR shall keep client indemnified of any liability and/ or complaint from local authorities/ municipal bodies for the same.

2.29 It shall be clearly understood that all the works mentioned above together with all incidental works whether specifically mentioned or not shall be deemed to have been included in the scope of work.

It shall be clearly understood that all the works mentioned above together with all incidental works whether specifically mentioned or not shall be deemed to have been included in the scope of work.

3. SCOPE OF SUPPLY

3.1 OWNER'S SCOPE OF SUPPLY

- NIL

3.2 CONTRACTOR'S SCOPE OF SUPPLY

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.

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.

4. ADDENDUM TO STANDARD AND SPECIFICATIONS

4.1 ADDENDUM TO GENERAL CIVIL SPECIFICATIONS

4.1.1 EIL STD. SPECIFICATION NO. 6-66-0004 Rev 1

(a) Clause 3.2.1 shall be read as

"Extinguisher shall be portable stored Pressure type with capacities 6 Kg /9 Kg. per requirement based on fire rating."

(b) Clause 3.2.3 shall be read as

Dry powder shall conform to IS: 14609, i.e. 90% Mono Ammonium phosphate (MAP)

(c) Clause 3.2.5 shall be considered as deleted.

(d) Additional Clause.

"Thickness of body plate used in 9 Kg. Capacity DCP Fire extinguisher shall be minimum 2 mm."

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5. 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. PREAMBLE TO SCHEDULE OF RATES

a. Central Public Works Department (CPWD) Specifications shall be followed for the following item of Schedule of Rates: B895-999-81-45-CF-SOR-8202.

Item No. of Schedule of Rates: B895-999-81-45-CF-SOR-8202 attached with tender	Code no of CPWD – Delhi Schedule of Rates Volume-2
11CS.18.7	18.7
11CS.18.8	18.8
11CS.18.9	18.9

b. Wherever “plant boundary” or “complex limit” is mentioned in the SOR or specifications, the same shall be read as “Refinery property limit of Kochi Refinery Complex” as mentioned in document no B895-999-81-45-00002, which include existing refinery, DHDS area, IREP area, B-1, B-2 & B-3, B5, A1 East & A2 West area.

c. Brick shall be read as Brick/Solid Concrete Block in SOR Item no 01GC.15.15, 01GC.15.ME01, 01GC.15.2, 01GC.15.3, 01GC.15.6, 01GC.15.8, 01GC.15.15 and 01GC.34.1 of Schedule of Rates: B895-999-81-45-CF-SOR.

d. Environment for selection of painting system shall be considered as Industrial marine.

e. 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.

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7. LIST OF ATTACHMENTS

A. STANDARD SPECIFICATIONS

S. No	Title of Document	Specification No.
1.	Civil & Structural works-Brick Masonry	6-68-0009
2.	Standard specification for health, safety & environment (HSE) management at construction sites	6-82-0001
3.	Standard quality assurance plan construction division (item rate contracts)	6-82-6100
4.	Specification for quality management system requirements from bidders	6-78-0001
5.	Specification for documentation requirements from contractors	6-78-0002
6.	Specification for documentation requirements from suppliers	6-78-0003
7.	Standard Specification for earthwork for U/G piping	6-65-0006
8.	Standard specification for underground and above ground G.I. pipeline system (water services)	6-65-0027
9.	Standard Specification for underground sewer system-pre cast R.C.C, pipes	6-65-0042
10.	Standard Specification for plumbing and building drainage	6-65-0053
11.	Standard specification for acid resisting brick / tile lining	6-65-0062
12.	Standard specification for portable fire extinguisher	6-66-0004
13.	Standard specification for non-percolating lay flat delivery hose for fire fighting	6-66-0011
14.	Standard specification for stand post type fire hydrant (with or without pumper connection)	6-66-0012
15.	Standard specification for first aid hose reel	6-66-0018
16.	Standard specification for hose cabinet	6-66-0047
17.	Standard specification for safety shower and eye wash	6-66-0038
18.	Standard specification for fabrication and erection of piping	6-44-0012
19.	Standard specification for inspection, flushing and testing of piping systems	6-44-0013
20.	Standard specification for cement lined piping	6-44-0074

B. INSTALLATION STANDARDS

S. No	Title of Document	Standard No.
1.	Abbreviations, legends and eqpt. Symbols	7-65-0001
2.	Detail of rungs for manholes, valve pits, tanks etc.	7-65-0211
3.	Standard miscellaneous details for manholes	7-65-0212

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4.	Gully trap chamber	7-65-0214
5.	Inspection chamber	7-65-0215
6.	Detail of rain water harvesting (catchment area ~ 500 sq.m.)	7-65-0442
7.	Detail of rain water harvesting (catchment area ~ 1500 sq.m.)	7-65-0443
8.	Detail of rain water harvesting (catchment area ~ 3000 sq.m.)	7-65-0444
9.	Detail of neutralization pit	7-65-0310
10.	Typ. detail of acid / alkali proof lining.	7-65-0412

C. DATA SHEETS

S. No	Title of Document	Drawing No.
1.	Data sheet for Landing Valve (stand post type fire hydrant)	B895-999-81-45-8011
2.	Data sheet for Hose Reel	B895-999-81-45-8012
3.	Data sheet for Hose Cabinet	B895-999-81-45-8013
4.	Data sheet for Air Release Valve	B895-999-81-45-8021

D. DRAWINGS

Sl. No.	Title of Document	Document No.
1	Complex Limit of BPCL Kochi Refinery	B895-999-81-45-00002

E. VENDOR DATA REQUIREMENT

Sl. No.	Title of Document	Document No.
1.	VDR for General Civil works	B895-999-81-45-VDR-8202

F. APPROVED VENDOR LIST

Sl. No.	Title of Document	Document No.
1.	Approved Vendor List	B895-999-81-45-LL-8201

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SCOPE OF WORK & JOB SPECIFICATION

(ELECTRICAL)

FOR

MISC. BUILDING TENDER WORKS

(TENDER NO. B895-999-81-46-CF-T-8202)

PROJECT	:	**PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**
OWNER	:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
JOB NO.	:	**B895**

Rev. No	Date	Purpose	Prepared	Checked	Approved
A	02.04.26	ISSUED WITH TENDER	NNB	AS	VK

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1.0 GENERAL

1.1 INTRODUCTION

1.1.1 This section defines the electrical scope of work for various buildings covered under the building works tender and shall be read in conjunction with EIL standard specifications, datasheet, & documents/drawings attached with tender. The intent of this specification is to define the electrical requirements for supply, installation, testing and commissioning of lighting, earthing, cabling, installation and wiring/ cabling for fire alarm system, cabling for public address system including installation of PAJB, cabling for telephone system including installation of telephone socket & JB, electrics of Air conditioning, solar roof top photovoltaic system (as applicable) etc. for the various buildings (covered in this tender as defined elsewhere) under the scope of this tender for PP Project at Kochi Refinery of M/s BPCL. system,

1.1.2 The work shall be carried out to the best workmanship like manner, in conformity with these specifications, approved drawings/ construction drawings and the instructions of the owner or Engineer-in-Charge from time to time.

1.1.3 The 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 under this contract.

1.2 STANDARDS

1.2.1 The work shall be performed in conformity with these specifications and other specifications / standards/ Codes of Practice specified or referred to in the tender. In case of any conflict, the most stringent one shall be followed and Owners/ EIL decision in this regard shall be final and binding. It is contractor's responsibility to bring the same to the notification of EIL.

1.2.2 In addition, the work shall also conform to the requirements of latest editions/ amendments of the following:

- The CEA guidelines and rules framed there under.
- The fire insurance Regulations.
- Indian Petroleum Rules.
- The regulations laid down by Electrical Inspectorate (CEA).
- The regulations laid down by the Chief Controller of Explosives.
- The regulations laid down by Oil Industries Safety Directorate (OISD).
- Applicable Codes of Practice of the Bureau of Indian Standards
- PNGRB
- Any other regulations laid down by the Central, State or Local Authorities from time to time during the execution of this contract.

1.3 GUARANTEE

1.3.1 The contractor shall guarantee the installation for satisfactory operation against any defects of workmanship and materials (supplied by the contractor) for a period as specified elsewhere. Any damage or defect connected with the erection of materials, equipment or fittings supplied by the contractor that may be discovered at the time of issue of the completion certificate, or arise or come to light thereafter, shall be rectified or replaced by the contractor at his own expense as deemed necessary and as per the instruction of Owner or Engineer-in-Charge within the time limit specified by the Owner or Engineer-in-Charge.

1.3.2 The above guarantee shall be applicable for the quality of the work executed as well as for all equipment/ cables/ fixtures/ fittings/ other materials supplied by the contractor.

1.4 SITE CONDITIONS

a.	Maximum temperature	:	46°C
b.	Minimum Temperature	:	1°C
c.	Design ambient temperature	:	45°C

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d.	Humidity	:	95% at 45°C
e.	Altitude above mean sea level	:	Less than 1000m above MSL.
f.	Seismic Zone	:	As per IS-1893
g.	Environment	:	Dusty, Tropical and Corrosive as found in Hydrocarbon Industry

1.5 UTILIZATION VOLTAGES

A	**AC Voltage and frequency variation**		
i.	Voltage	:	± 10%
ii.	Frequency	:	± 3%
B	**Utilization voltage**		
iii.	MV motor voltage (0.18≤kW ≤160)	:	415 V AC except VFD motor
iv.	AC Motors rated below 0.18 kW	:	240 V AC
v.	Actuators for Motor operated valves	:	415 V AC, TP
vi.	AC Lighting/Power Panels	:	415 V AC, TPN
vii.	Auxiliary Boards incoming power supply	:	415 V AC, TPN
viii.	Welding Receptacles	:	415 V AC, TPN
ix.	Normal Lighting/Emergency Lighting	:	240 V AC, SPN
x.	Convenience outlets	:	240 V AC, SPN
xi.	LAN UPS output Voltage	:	240V AC, SPN
C	**Utilization voltage for critical supplies**		
xii.	Critical lighting power supply	:	110 V DC ± 10%
xiii.	Electrical protection and Control system		110 V DC ± 10%
xiv.	Input power supply for fire alarm system	:	240 V AC, SPN Non – UPS supply (with Dedicated battery backup)

2.0 SCOPE OF WORK

2.1 The electrical scope covered under this tender includes complete electrical works pertaining to lighting, earthing & lightening protection, cabling for telephone system, fire alarm system & Plant communication system, Installation of fire alarm system & Plant communication system for the following buildings covered under the scope of this tender.

- Substation SS-JP1
- SRR-11
- IA/PA/N2 Substation SS-JU1 and SRR-12
- Catalyst Ware house/Chemical Storage
- Peroxide storage building
- Teal Storage
- DG Shed
- Gate House
- Any other building covered under this tender

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2.2 The scope shall also include all electrics for the packages (viz. Air-conditioning system, Roof top solar photovoltaic system etc.) as mentioned elsewhere, including supply, installation, testing and commissioning of Fixed type MV switchboards, VFD panels, motors, local control station, etc. and supply and installation of cabling, lighting and earthing for the packages as described under the particular specifications for Air-conditioning, solar power system etc. covered in this document. Contractor to note that same shall be supplied along with package as a part of the package and no separate payment shall be admissible for the same.

2.3 Contractor to note that 415V TPN incoming power supply shall be provided to HVAC PDB by Owner. All further cabling from PDB to switchboards, as applicable and equipment required for feeding HVAC loads in respective packages is in contractor's scope. Prices for complete electricals for HVAC shall be deemed to be included in the common SOR item rate included for HVAC in the mechanical SOR. Electrical SOR items mentioned are not applicable for HVAC package.

2.4 The scope shall also include handling, transportation of free issue equipment/ material from owner's stores/ warehouse to the place of installation and supply of commissioning spares wherever required.

2.5 All associated work related to minor civil, structural, architectural works for these buildings as covered in the respective parts are also included in the contractor's scope, including making good of breakages of civil works, Patch/touch-up painting as required.

2.6 Any requirement of control supply, if not available at site i.e. 110V DC for testing and commissioning of Electrical equipments shall be arranged by contractor without any time and cost impaction to Owner/EIL.

3.0 SUPPLY, INSTALLATION, TESTING AND COMMISSIONING (EQUIPMENT/MATERIAL SUPPLIED BY CONTRACTOR)

Scope of work shall include supply, installation, testing and commissioning of all equipment and systems to meet the requirement defined in specifications & data sheets attached with the tender and required for completion of the job including but not limited to the following. Detailed scope of work and quantities for respective locations shall be as per Schedule of Rates enclosed with the tender.

3.1 Electrics of complete package including HVAC.

3.2 Lighting and Power Panel for safe area and Hazardous Area, as applicable.

3.3 LED Lighting fixtures, junction boxes, switch/ sockets and convenience receptacles, ceiling fans, exhaust fans for safe area.

3.4 Hazardous lighting fixtures, Lamps, receptacles & epoxy painted exhaust fans suitable for IIC classified area for installation in battery room.

3.5 Hazardous lighting fixtures and Lamps, receptacles, exhaust fans and switches for installation in Peroxide storage, Catalyst ware house and Teal Storage buildings

3.6 DC LED Light fixtures

3.7 Emergency lighting fixture with built in battery

3.8 PIR technology based non-regulating programmable type Occupancy sensor

3.9 Safe area, Hazardous area ceiling fans & exhaust fans, as applicable.

3.10 Safe area MCB box

3.11 Junction boxes for Plant communication system.

3.12 Junction boxes for Fire Alarm system.

3.13 Junction boxes for telephone system

3.14 Junction boxes for DC distribution.

3.15 Industrial type WP Push button station for lighting control at all major entrances of each substation.

3.16 Cables and wires for lighting, sockets.

3.17 UPS power panel for LAN system and socket/receptacle for IT equipments.

3.18 Telephone sockets

3.19 All electrics of roof top solar photovoltaic system as per specific requirement of roof top solar photovoltaic system at clause no. 9.0

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3.20 1100 V grade XLPE insulated armoured power cables with Al/ Cu conductor, extruded PVC sheathed (FRLS Type) cables.

3.21 Twisted pair, stranded copper conductor, XLPE insulated, individual pair shielded, overall screened/shielded, armoured, FRLS outer-sheathed control cables with cable glands, lugs etc.

3.22 Twisted pair, stranded copper conductor, XLPE insulated, overall screened/shielded, armoured, FRLS outer-sheathed fire alarm, plant communication cables with cable glands, lugs etc.

3.23 Twisted pair, stranded copper conductor, XLPE insulated, overall screened/shielded, unarmoured, FRLS outer-sheathed fire alarm, plant communication cables with cable glands, lugs etc.

3.24 Complete earthing and lightning protection system including G.I. earth electrodes in test pits, earth strips, earth plate and earthing cable for equipment earthing etc. Equipment earthing shall be done by using green coloured PVC insulated aluminium cable from earth plate onwards. All earthing hardware (i.e. nut, bolts, etc.) for earth pits, earth plates connection cable trays earthing, etc. shall be of stainless steel grade SS 304. Earth Electrode cover shall be FRP type.

3.25 Anchor fasteners, tinned copper/aluminum/bimetallic lugs and nickel-plated brass cable glands. The cable glands shall be single compression type for indoor equipments & double compression type for outdoor equipments.

3.26 Flameproof/weather proof cable glands suitable for hazardous area and safe area.

3.27 Circuit wiring in hazardous area and safe area.

3.28 All necessary facilities for providing Access control system of building entries shall be provided.

3.29 Any other material though not specifically mentioned above but required for completion of the work as per specifications, drawings and instruction of Engineer-in-charge.

4.0 SUPPLY AND INSTALLATION (EQUIPMENT/ MATERIAL SUPPLIED BY CONTRACTOR)

4.1 Black enameled steel surface/ PVC Concealed conduits, as required for cables of lighting, fire alarm & plant communication system.

4.2 GI cable trays and accessories such as Coupling and connection hardware of cable trays shall be of stainless steel grade SS 304 including all materials, fittings and GI cable tray covers, wherever specified.

4.3 METSEC Channels as required in buildings.

4.4 G.I. pipes for cable protection above ground, floor sleeves, and supports wherever necessary.

4.5 All hardware like nuts, bolts, washers, spring washers, grouting bolts etc. necessary for completion of job. All hard wares shall be of SS-304.

4.6 Miscellaneous material like sand, bricks, plain cements concrete, bitumen etc. for civil works.

4.7 Stone dust of grading zone II as per BIS-383 in cable trenches including providing of brick protection by second class brick.

4.8 Making cut-outs in RCC slab/wall and brick wall, as required.

4.9 Safety insulating mats, as required.

4.10 Structural steel supports, brackets for miscellaneous electrical equipment including welding, bolting etc. and necessary supplies and connection works, as required, all inclusive of painting as per SOR item. (The structural steel shall not be paid extra. The same shall be included in the respective installation item).

5.0 INSTALLATION & CONNECTION (EQUIPMENT / MATERIAL SUPPLIED BY EIL / OWNER)

5.1.1 Fire alarm system equipments like Fire alarm Panel, Repeater Panel, multi sensor detectors, heat detectors, Exit sign, hooters, control relay module, fault isolator module, Siren etc.

5.1.2 Plant Communication system equipments like FCS, loud speaker, exchange etc.

5.1.3 Telephone System like telephone Junction boxes. Wiring from TJB to all the telephone sockets within the buildings shall be in the scope of Contractor.

Note: **Quantities given in SOR are tentative. Contractor shall take approval of Engineer-in-charge / Owner before ordering of equipment / materials.**

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For scope of LAN, refer ITS scope of work document.

6.0 MISCELLANEOUS REQUIREMENTS

6.1 Scope of supply of nickel-plated brass glands, tinned copper lugs/Bimetallic lugs/Aluminium lugs and blocking plugs (as required) and making of termination for all items rated up to 1.1kV, supplied by the contractor shall be part of the respective SOR item only, whether specifically mentioned or not in the item. Cable glands shall be single compression type and double compression type for indoor and outdoor equipment respectively.

6.2 Preparation of channel/conduit layout for fire alarm, plant communication, lighting and telephone as per directions of the Engineer – in – charge & based on the AFC layout drawings (Lighting, telephone, FA & plant communication system) to be issued during execution of works.

6.3 Coordination of Lighting Installation works for areas with false ceiling, air-conditioning and fire alarm layout drawings & installation contractors.

6.4 Coordination between various agencies/ equipment vendors/ other contractors working at site and providing all assistance and interface connections (to other contractors/ agencies/ vendors involved in the complex) as per drawings to enable others to take up testing and commissioning activities of their equipment/ systems.

6.5 Small civil works in buildings for cable entry and installation of equipment etc.

6.6 Supply and installation of all other accessories not specifically mentioned herein but nevertheless necessary for completion of job.

6.7 Engineering & preparation of specifications & drawings for electrical equipment installation, wherever applicable/required by Owner/ Engineer-in-charge & submitting the same to Owner/ Engineer in charge for review/comments.

6.8 Preparation of field testing and commissioning procedures

6.9 Correction and submission of all owners' drawings for as - built status. (Hard and soft copies based on native AUTOCAD files provided to contractor).

6.10 Obtaining clearance and approvals for installation/ drawings from Central Electricity Authority / any other statutory authority for energizing the complete electrical facilities covered under this tender.

6.11 It may be noted that no separate payment shall be made for any statutory approvals and the cost shall be deemed to be built in the rates quoted for various SOR items.

6.12 Other activities listed in data sheets/ vendor data requirement formats.

6.13 Minor modifications, wherever needed, for the free-issued material/ equipment/ devices to enable cable entry/ termination, wiring changes etc.

6.14 Sealing of openings made in walls/ floors, firewalls for cables etc., using acceptable practices and standards to the satisfaction of Owner/ Engineer in charge.

6.15 All consumables and non-consumables including materials, tools, tackles, plant machinery, labours, etc. required for completion of the works as per Schedule of Rates shall be in contractor's scope of supply.

6.16 Single phase power supply is feeders are envisaged for rolling shutter.

6.17 Any other item/work/activity which is not specifically listed but is necessary for completeness of electrical system as per specifications, drawings and instructions of Engineer-in –charge.

6.18 **Co-ordination with Other Contractors/ Agencies**

It is the responsibility of the contractor to coordinate and provide all necessary assistance for proper and timely execution of the works.

7.0 WORKS EXCLUDED

7.1 Supply and laying of incoming cables up to AC system (HVAC) PDB.

7.2 Supply of equipment/material as listed under clause 5.0 above.

7.3 Supply, testing and commissioning of Fire alarm & detection system.

7.4 Supply, testing and commissioning of Plant Communication system system.

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8.0 SPECIFIC REQUIREMENT FOR AIR CONDITIONING

8.1 Contractor scope shall include sizing, design, engineering, manufacturing, supply, installation, testing and commissioning, packing and delivery at site of all the electrical equipments including supply of all commissioning spares, special tools and tackles as per the specifications and the datasheets attached or referred. The major electrical equipments for the package includes the following but not limited to:

a.) All MV motors

b.) Power distribution board – PDB

c.) Power & Control Cables

d.) Local Control Stations

e.) Earthing Materials

8.2 **MV Motors:**

8.2.1 All MV motors shall conform to EIL specification 6-51-0064 and motor datasheet attached. Motor shall be suitable for installation in safe area. Field ammeter shall be provided in LCS (as applicable) for motors above 5.5 kW. Motors rated 30kW and above shall be provided with anti-condensation heater.

8.2.2 All MV motors shall be IE3 efficiency level in line with IS 12615.

8.3 **Power Distribution Board, PDB:**

8.3.1 Power distribution board – PDB for all motors and other load of the package, separate for each building (PDB shall be installed in AC Plant/ Package room, AHU room, as required).

8.3.2 A summary of the number of Power Distribution Boards (PDBs) to be provided by the vendor is given below, building wise

i)	For S/S-JP1	-	One PDB in AC Plant Room
ii)	For SRR-11	-	One PDB in AC Plant Room
iii)	For S/S-JP1	-	One PDB in AC Plant Room
iv)	For SRR-12	-	One PDB in AC Plant Room
v)	For Catalyst Ware house	-	One PDB in AC Plant Room
vi)	For Peroxide Building	-	One PDB in AC Plant Room

8.3.3 Min. Rating of switchboards shall be as follows:

For Air-conditioning system

i)	For S/S & SRR	-	400 A (to be checked w.r.t final load of HVAC)

Above mentioned values are min. ampere rating of the switchboard. Final values shall be selected by vendor based on load demand of the package and Fault level of the switchboard as per this package.

8.3.4 The PDB to be supplied by the Contractor for AC system shall conform to EIL specification 6-51-0012, 6-51-0093 and datasheet for fixed type switchboard.

8.3.5 PDB shall be single front, compartmentalized and fixed type. PDB shall be suitable for 415V, 50Hz, TPN, source fault level 50 kA (1 sec.) with single bus, two incomers with MCCB shall be provided with manual transfer facility and mechanical interlocking between incomers. For incomers above 400 A, ACB with numerical relay shall be provided. Breaker feeders in switchboards shall be draw out type.

8.3.6 Control Supply for HVAC PDBs, located in Peroxide storage and Catalyst ware house shall be 240V AC supply derived using control transformer.

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8.3.7 PDBs shall be suitable for TOP Cable entry. All Minimum clear space of 1000mm shall be maintained in front of PDBs. All around clearances shall be maintained as per IE rules.

8.3.8 PDBs shall be provided with 20% spare capacity in the switchboard.

8.3.9 All outgoing motor feeders Up to 55 kW (Including 55kW) shall be provided with MCCB with Contactor and communicable Electronic Motor Protection Relay (CEMPR) and CEMPR relay shall have following features which are listed below.

8.3.10 Multi-Protection: thermal overload (different curves/thermal constant), Stall(settable), Lock rotor(settable), phase unbalance, phase reversed Asymmetry, Ground fault (with option of instantaneous trip time), Short circuit (with option of instantaneous trip time)

8.3.11 Display for causes of the type of fault and values 3 phase & earth element current in digital ampere meter

8.3.12 Display for running three phase current, Motor load (%)

8.3.13 CT ratio shall be settable in Digital MPR

8.3.14 ON' and 'OFF' position of the operating handle of MCCB shall be displayed and the operating handle shall be mounted on the door of the compartment housing MCCB. Each MCCB shall be provided with minimum 1 NO + 1 NC auxiliary contact and 1NO contact for tripping indication/alarm for owner's use.

8.3.15 Feeders for all MV motors upto 55kW shall be controlled through MCCB, contactor, CEMPR, CBCT & ELR where overload relay and ELR shall be part of DMPR.

Feeders for all MV motors rated above 55 KW shall be controlled through ACB with numerical relay.

8.3.16 MCCB's as part of motor starter module shall be current limiting type and type tested for type-2 coordination as per IS/ IEC 60947.

8.3.17 Strip Heater module in HVAC-PDB shall have ammeters.

8.3.18 The number of feeders in the PDB shall be as per the electrical loads of the respective building, where PDB is located. PDB for AC Plant room in various buildings shall also include feeders for downstream PDBs located in each AHU Room.

8.3.19 Providing required interlocking between main PDB & sub PDB (if any) of A/C system of a particular building shall be in contractor scope.

8.3.20 For Air-conditioning systems, all blowers shall trip and all “Fire Dampers” shall automatically close on receipt of “Fail-safe FIRE signal” i.e., normally closed but open on Fire condition contact. This contact shall be provided by Owner at vendor’s PDB in each building. Further distribution of fire signal to each vendor’s sub PDB (if any) shall be in contractor’s scope.

8.3.21 20% spare outgoing feeder or minimum one of each type, whichever is higher shall be provided for each PDB.

8.3.22 Safety insulating mats of required voltage grade shall be provided in front and rear of electrical PDBs as required.

8.3.23 Co-ordination required for lighting, fire alarm etc. installation works for areas with false ceiling and/ or air-conditioning ducts is in scope of vendor.

8.3.24 Contractor to Refer datasheet for MV Switchboard (fixed type), MV Switchboard component rating, various type of feeder’s hardware details, Motor datasheet attached with the tender for Air conditioning.

8.3.25 The validity requirements for the type test certificates for MV switchboards, breakers shall be as per the table given below:

S. No	Type Test	Equipment	Validity
1.	Short Circuit Withstand Capacity	MV Switchboards	Upto 10 years from the final bid opening date or design change whichever is earlier
2.	Heat Run	MV Switchboards	Upto 10 years from the final bid opening date or design change whichever is earlier
3.	Degree of protection for panels	MV Switchboards	Till any design change

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Note: In case the type tests on the offered design of switchboards and breaker do not meet the above criteria, all required type tests shall be conducted by the successful vendor on the offered design of equipments after order finalization without any extra cost and delivery impact.

8.4 **Power and Control Cables:**

8.4.1 Supply, laying and termination of all power and control cabling beyond PDB (Including termination of incoming cables to PDB) for all package loads. Cables shall be as per EIL specification 6-51-0051 attached with tender.

8.4.2 Power cables used for MV motors shall be with 3 cores. The conductor size shall be minimum 4mm2. The conductor material for M.V. power cables shall be copper up to 16 mm² and Aluminum for 25 mm2 and above.

8.4.3 Control cables shall be copper conductor, twisted pair individual as well as overall screened/ shielded type. Minimum size of control cable shall be 2.5 sq.mm. The conductor shall be stranded.

8.5 **Earthing:**

8.5.1 Equipment earthing for AC system is in the scope of vendor.

8.5.2 One no. earth plate shall be provided within AC room, AHU room, further connection of individual equipments with earthing system shall be under vendor's scope. For earthing of various equipments up to earth plate, enclosed equipment earthing schedule shall be followed.

8.5.3 Earthing material as required for earthing for package equipments.

8.6 **Miscellaneous:**

8.6.1 Vendor scope includes supply of tinned copper lugs, and nickel-plated brass cable glands for all cabling & termination (in the scope of vendor) inclusive of cable glands for incoming cable to PDB. The cable glands shall be single compression type for indoor equipments & double compression type for outdoor equipment.

8.6.2 Cable trays, as required for laying the cables for the motors/ loads.

8.6.3 Local control panels/ local push button stations (as required).

8.6.4 Independent LCS with ammeters shall be provided for all the auxiliary motors of HVAC system i.e. cooling water pump motors, condensate pump motors, chiller pump motors etc. These LCS shall have LOTO facility.

8.6.5 All necessary supporting hanger, MS structure for supporting units, anchor fasteners, nut, bolts etc.

8.6.6 Any other equipment not specifically mentioned above but required for normal operation of the package equipment.

8.7 **Unit prices for 2 year Operation and Maintenance Spares**

8.7.1 Vendor shall furnish a list with unit prices for spares for two years of normal operation for all electrical equipment provided as part of Air conditioning.

8.7.2 All commissioning spares shall be included in Vendor's scope.

8.7.3 All mandatory spares as specified (elsewhere) in this document are included in Vendor's scope.

9.0 SPECIFIC REQUIREMENTS FOR ROOF TOP SOLAR PHOTOVOLTAIC SYSTEM

9.1 Roof top solar photovoltaic system is envisaged at IA/PA/N2 Substation-JU1/SRR-12 building & Gate house under the scope of this tender. Roof tower solar photovoltaic system provided at this building shall be able to generate minimum 95 kWp power output for IA/PA/N2 Substation-JU1/SRR-12 building and minimum 20 kWp power output for Gate house. Vendor scope shall include sizing, design, engineering, manufacturing, supply, installation, testing and commissioning, test running at site, packing and delivery at site of grid connected roof top solar photovoltaic system including supply of all commissioning spares, special tools and tackles as per the standard specification no. 6-51-0022 and the datasheets attached or referred. The major electrical equipments for the package includes:

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9.1.1 Solar PV modules including mounting frames, structures, array foundation and module inter connection.

9.1.2 Array Junction boxes, Main Junction boxes and Fuse boxes / circuit breakers.

9.1.3 Power Conditioning Units (PCU), AC power evacuation panels with bus bars and circuit breakers.

9.1.4 Metering and protection / Isolation systems.

9.1.5 MV Power and Control Cables including end terminations and other required accessories for both AC & DC power including supply, laying and termination of cable from PCU/AC Power evacuation panel to 415V Main distribution board in building (supplied by others as part of this tender).

9.1.6 Earthing system for PV Array, DC power system, AC power system equipment, PCU etc., Lightning protection system.

9.1.7 Data acquisition and monitoring system with remote monitoring facilities.

9.1.8 The civil erection work including civil foundation shall be performed with respect to the following but not limited to:

a) Solar PV modules array, mounting frames.
b) Power & Control Cables.
c) Entire cable trays, supports, accessories.
d) Galvanized steel conduits and accessories, PVC pipes, ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes, cable fixing clamps, nuts and bolts etc. as required
e) Steel materials for field fabrication as required.

9.1.9 Any other equipment not specifically mentioned above but required for normal operation of the package equipments.

9.2 PV panels shall be installed on the complete building terrace area which includes roof top of building, transformer bays for substation, except for personnel movement area and area for other facilities installed on the roof top.

9.3 PCU shall be located indoor. PCU enclosure panel shall have min. IP-31 degree of protection.

9.4 AC power evacuation panel/ ACDB shall be suitable for fault level of 50kA (1 sec.).

9.5 Contractor shall engage the services of a separate specialist agency/manufacturer for execution of solar power plants including design, engineering, sizing, selection & procurement of equipment/material, installation, testing and commissioning of solar power plants. The agency shall be an established manufacturer/supplier of complete SPV power system and shall have adequate experience for carrying out similar SPV based solar power plants. The agency should have designed, supplied, installed and commissioned SPV power plants of cumulative installed capacity of 95 kWp or above for IA/PA/N2 Substation-JU1/SRR-12 building and 20 kWp or above for gate house, out of which at least one plant should be of 95 kWp capacity operating satisfactorily for more than one year for Substation-JU1/SRR-12 building and 20 kWp capacity operating satisfactorily for more than one year for Gate House. The agency shall be approved by Consultant/Owner during detail engineering based on details furnished by contractor.

9.6 Contractor/manufacturer shall ensure proper system designing that would include studies on peak sunshine data, resulting in the correct sizing of equipment for the solar energy system and get the same approved from the Consultant/owner. It is important to form proper design procedures and component sizing before any actual implementation. The design procedures and component sizing shall be as per internationally acceptable standards. The contractor shall show details with the help of software to establish the solar light / heat available during various parts of the day/month/year and substantiate this with the help of data of the generation capacity of plant being proposed by them.

9.6.1 Based on the insolation data, the solar PV systems shall be so designed that it shall take into account the mean energy output after allowing for various losses, temperature corrections, on an average day for each month of the year.

8.0 EQUIPMENT SPECIFICATION

8.1 CABLES AND CABLE TRAYS

a. All power cables shall be as per datasheet attached with the tender and 6-51-0051.

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b. Fire alarm and plant communication cables shall be complying with EIL specification no. 6-51-0052.

c. All the control cables envisaged in the scope of this tender shall be 1100V grade, multi-strand copper conductor, twisted pair, XLPE insulated, individual pair shielded as well as overall screened/ shielded type, PVC inner sheathed, steel wire/strip armored, with PVC FRLS outer sheath of black color complying to EIL specification no. 6-51-0052.

d. All FA and PA cables envisaged in the scope of this tender shall be 1100V grade, multi-strand copper conductor, twisted pair, XLPE insulated, overall screened/ shielded type, PVC inner sheathed, steel wire/strip armored, with PVC FRLS outer sheath complying to EIL specification no. 6-51-0052.

e. The cables shall be tested and inspected at the manufacturer's works as per relevant international code. Relevant test certificates shall be produced as & when required.

f. All MV power cables 2.5 sqmm to 16 sqmm shall be with copper conductor and above 16 sqmm shall be aluminium conductor. Recommended limiting size of multi-core cable is 300 sqmm. Power cables used for MV motors shall be with 3 cores.

g. Minimum size of various cables shall be:

Power cables	:	2.5 sqmm (Copper) & 4 sqmm. for motors
Control cables	:	2.5 sqmm (Copper)
Lighting cables	:	2.5 sqmm (Copper)
Communication cables	:	0.9 mm dia. (Copper).
Fire alarm system	:	1.5 sqmm (Copper)
Telephone system	:	0.63 mm dia (copper)

h. The size of fire alarm cable for manual call points/ detectors loop & power supply loop shall be minimum 2 pair, 1.5 sq.mm, annealed copper conductor, overall screened. Fire alarm cables shall be with red color outer sheath.

i. The size of Plant communication shall be minimum 5P pair, 0.9 mm dia. loud speaker cable connected form FCS shall be 2 pair, 1.5 sq.mm. Plant communication cable shall be with gray color.

j. Cable trays shall be Hot dip Galvanized iron.

k. GI Sheet covers shall be provided at the bottom of the bottom most cable trays, if trays are laid on pipe rack with hydrocarbon piping below the cable trays.

l. For lighting inside the building, minimum 1.5 sq.mm copper conductor, PVC Insulated wire shall be used in conduit system (for circuit and point wiring), with proper colour coding.

8.2 LIGHTING SYSTEM

a. All Lighting fixtures shall be LED type, supplied complete with associated LED lamp and driver and suitable for the area in which they are installed. Selection of lighting fixtures shall be as per the attached fixture schedule and lighting philosophy.

b. Lighting fixtures envisaged in the battery room shall be flameproof type.

c. The requirement of lux level at various places has been specified in the standard specifications enclosed. CONTRACTOR shall demonstrate that the actual lux achieved at various locations, (in scope) in line with specified lux values and augment the lighting, if found to be inadequate.

d. Typically, emergency lighting shall constitute 20-25% of total lighting.

e. DC critical lighting shall be provided to enable operation in the event of power failure. DC lighting fittings suitable for operation at 110V DC shall be provided at exit, escape route inside the buildings. DC lights shall have a red color ring painted on the fixture.

f. Emergency lighting with inbuilt battery backup with 120 minutes shall also be provided for remotely located buildings to enable operation in the event of power failure. They shall be provided at exit, escape route inside the buildings.

g. For the purpose of identification, all AC emergency lighting fixture shall have a red colour painted on the fixture for identification.

h. External hardware of lighting fixtures, junction boxes, welding receptacles, 230V receptacles, lighting panel, mounting bolts etc. shall be of stainless steel (SS304).

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i. Lighting and power panels shall be suitable safe area, and shall be suitable for 415V, 50Hz, TPN incoming supply and standardized to have 6, 12 or 18 single phase outgoing feeders for 240V, SPN supply.

j. All lighting fixtures shall also have independent earth terminal outside the enclosure.

k. CONTRACTOR to ensure the following in Lighting Fixtures:

a) Make of fixtures shall be embossed on the body of the lighting fixtures.

b) Make of fixtures shall be embossed on the body.

c) In case any of the referred models / makes are discontinued, prior approval from the engineer-in- charge has to be taken for supplying any alternate makes / models.

d) Manufacturers should ensure that all LED panels are sourced from reputed LED manufacturers.

l. **MISCELLANEOUS REQUIREMENTS**

a.) For LED fixture, integral junction box shall be provided with 3 nos. cable entries for loop-in, loop-out and associated wiring to fixture. Alternatively 2 nos. cable entries for loop-in and loop-out shall be provided with internal wiring for driver and lamp.

b.) All lighting fixtures shall be supplied complete with associated LED lamp and driver.

c.) Flameproof LED type lighting fixtures shall fulfill the following requirements:

- LED lamps and Drivers shall be provided with min. 5 years warranty period.
- Lighting fixtures reserved for use in 240 Volt AC Emergency Circuit shall have additional RED Circular ring marking for identification purpose for hazardous area identification. This detail shall be furnished to successful vendor during detailed engineering.
- Vendor shall indicate the following parameters as a minimum in fixture drawings:

- Fixture Wattage and LED Wattage
- Actual Consumption of Fixture
- Driver Consumption
- Fixture Life time
- Luminous Efficacy of fixture
- Lumen Output of Fixture
- Tolerance for Voltage and wattage rating
- Power factor of Fixture
- Beam Angle of Lighting Fixture
- Weight of Fixture
- LED LAMP and Driver Warranty Period
- Driver Surge Protection
- Compliance to IEC-61347-2-13 for LED Driver
- BIS Certification no. for Driver
- Driver Make and Model No.
- LED Make and Model no.
- LED type i.e. COB (Chip on Board) or Multichip etc.
- Quantity of Fixtures
- No. of Cable entries for Fixture along with quantity of FLP Cable glands and FLP Stopper plug.
- PESO/CIMFR/BIS License certificates numbers along with dates.
- IES files of all LED lighting fixtures finalized during detail engineering shall be furnished for Owner/EIL records.

8.3 RCCB shall be considered in each outgoing of Lighting / Power Panel circuit, as per standard design practice. ELCB shall be read as RCD / RCCB in complete tender and suitable device shall be provided accordingly.

8.4 The type of MCBs & RCCBs shall be as below as per NEC requirements:

8.4.1 MCBs

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a) Type B – General application

b) Type C – Air conditioner (AC)

c) Type D – UPS power circuit

8.4.2 RCCBs

a) Type AC – General application

b) Type A – for LEDs

c) Type F – 1-ph Air conditioner (AC)

8.4.3 RCCBs with maximum sensitivity of 30mA shall be provided for outgoing feeders in all lighting & power panels.

8.4.4 All incoming and outgoing MCB and RCCB shall be mounted on the panel door.

9.0 GENERAL REQUIREMENTS

9.1 Various electrical works covered under this contract like equipment installation, cabling, earthing works, etc. shall be performed in accordance with the EIL standard specifications & installation standards enclosed with the tender document. (Certain clauses of specifications which are applicable to equipment or systems not covered under this contract shall be omitted).

9.2 Installation, testing and commissioning of equipment shall be performed in accordance with supplier's instructions and directions of the engineer-in-charge.

9.3 Makes of electrical materials/ components/ equipment shall be selected out of the list given in this document. All electrical equipment shall be brand new with state of the art technology and proven record. No prototype shall be offered. The make and type of equipment, if not specified in this tender shall be subject to OWNER / EIL approval.

9.4 All electrical equipment shall be said to be installed and mechanically complete after circuit testing and loop simulation is complete. Due care and consideration shall be given to the installation of all equipment, material and facilities.

9.5 Contractor shall coordinate with manufacturer of other equipment wherever required and shall freely and readily supply all technical information for this purpose as and when called for.

9.6 For cable dropping of Fire alarm and Plant communication equipment's, armoured cable shall be glanded in a GI junction box before dropping, dropping shall be through wall mounted standard concealed conduit, without armour.

9.7 All equipments supplied by the contractor shall be supplied with nickel plated brass cable glands (where required) and bimetallic lugs and accordingly the quoted rates for the items in SOR shall be deemed to include the cost of these cable glands and lugs. The cable glands shall be single compression type and double compression type for indoor and outdoor equipment respectively.

9.8 All other Electrical equipment, materials and work not explicitly mentioned but nevertheless required to fulfil the following minimum requirements shall be deemed to be included in the scope of the CONTRACTOR with no additional cost and time implication to OWNER / EIL

a) Achieving the plant equipment and personnel safety.
b) To meet the equipment and environment safety.
c) To suit site facilities and environmental conditions.
d) To meet the requirement of statutory approving authority
e) To co-ordinate with other CONTRACTORS and agencies involved in at site for other activities and site work.

9.9 Cable lug material shall be selected based on the application as under: -

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Sr. No.	Description	Cable lug material
1.	Copper conductor cable & copper bus bar/ terminals	Tinned Copper
2.	Copper conductor cable & Aluminium bus bar/ terminals	Bi-metallic (Copper barrel with Aluminium palm)
3.	Aluminium conductor cable & Copper bus bar/ terminals	Bi-metallic (Aluminium barrel with tinned Copper palm)
4.	Aluminium conductor cable & Aluminium bus bar/ terminals	Aluminium

10.0 MANDATORY SPARES

Following mandatory spares are included in contractor's scope:

SL. NO.	PART DESCRIPTION	DESCRIPTION
1.	**MV SWITCHBOARD**	one set of spare for each switchboard (refer Note-7)
1.1	Shunt trip coil	1 No. of each rating & type
1.2	Control fuses / MCB	10 Nos. each rating & type
1.3	Indicating lamps covers	5 Nos. of each colour
1.4	Indicating lamps	20% or 3 Nos. (min.), whichever is more
1.5	Contactor contacts	1 set for each rating and type
1.6	Closing Coil	1 No. of each rating and type
1.7	Breaker Finger Jaws	1 set of each rating and type
1.8	Ethernet Switch	1 no. of each type
2.	**Variable Frequency Drive (one set of spare for each VFD), as applicable**	**Quantity is per VFD and Soft Starter**
2.1	Transistors / IGBT / IGCT	1 No of each rating & type
2.2	Control cards	1 No of each type
2.3	Power supply cards	1 No of each rating & type
2.4	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
2.5	Control fuses / MCB	10 Nos. of each rating & type
2.6	Contactors	10% of each type OR 1 no. (min) of each type, whichever is more
2.7	Indicating lamps	20% OR 1 nos. (min.), whichever is more
2.8	Indicating lamps covers	2 nos of each colour
2.9	Blocker Diode	2 nos. of each rating & type
2.10	Control power supply module	1 No of each rating & type
2.11	Power module	3 No of each rating & type
3	**MV induction motors 37 Kw & above**	**one set of spare for each rating & type**
3.1	Bearing (DE & NDE)	1 set

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3.2	Terminal studs/bushing assembly	1 set each
4	**Solar Photovoltaic System**	**One set of spare for each system**
4.1	Power Thyristor/Transistors / IGBT / IGCT	1 No of each rating & type
4.2	Control cards	1 No of each type
4.3	Power supply cards	1 No of each rating & type
4.4	Cable connectors	10% or minimum 2 Nos. of each type

NOTES:

1. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.
2. Wherever % age is identified, Contractor shall supply next rounded figure.
3. The terminology used under 'Part Description' is the commonly used name of the part and may vary from manufacturer to manufacturer.
4. Mandatory spares as indicated above do not cover commissioning spares.
5. Mandatory spares as indicated above do not cover two year O&M spares.
6. Mandatory spares shall be applicable for electrical items of motors / sub-packages as per mandatory spares philosophy specified elsewhere in the bid document.
7. MV Switchboard shall include fixed and draw-out type of switchboards such as PCC, MCC, PMCC, EPCC, EPMCC, ASB, LDB, ELDB, package switchboards etc.

11.0 STATUTORY APPROVAL OF WORKS

11.1 Contractor shall make an application on behalf of the owner for submission to the 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.

11.2 The Inspection and acceptance of work as above shall not absolve the Contractor from any of his responsibilities under this contract.

12.0 INSPECTION, TESTING AND COMMISSIONING

12.1 Site inspection, testing and commissioning of electrical installation shall be carried out as per enclosed Specification no. 6-51-0087 and Inspection and Test Plans listed in the list of attachments.

12.2 All the equipment installed by the contractor shall be tested and commissioned, as required and no separate payments shall be made unless otherwise specified in the Schedule of Rates. Contractor shall carefully inspect all equipment before receiving them from owner/EIL for installation purposes. Any damage or defect noticed shall be brought to the notice of the engineer-in-charge at that time.

12.3 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectification at his own cost.

12.4 The contractor shall carry out all the tests as enumerated in the tender and technical specifications and technical documents which may be furnished to him during performance of the work.

12.5 Before the electrical system is made live, the contractor shall carry out suitable tests to establish to the satisfaction of Engineer-in-Charge/ Owner/ EIL that the installation of equipment, cabling/ wiring and connections have been correctly done and are in good working condition and that the system/ equipment will operate as intended.

12.6 All tests shall be conducted in the presence of Owner/ EIL/ Engineer-in-Charge or his authorized representative unless he waives this requirement in writing. Contractor shall arrange testing equipment, as required to carry out the tests. Test results shall be recorded on approved Performa and certified records of the tests shall be submitted to Owner/ EIL/ Engineer-in-Charge.

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12.7 After the completion of all tests and rectification of all defects pointed out during final inspection, plant start-up trials shall commence. During the start-up trials, contractor shall provide skilled/ unskilled personnel and supervision round the clock at his own cost. The engineer-in-charge/ owner/ EIL will decide the number and the category of workmen and their duration. Any defects noticed during the start-up trials relating to the equipment supplied and work carried out by the contractor, shall be rectified by the contractor at his own cost.

12.8 Owner/ EIL/ Engineer-in-Charge shall have the right to get the defects rectified at the risk and cost of the contractor if he fails to attend to the defects immediately as desired.

12.9 Contractor shall also inform Owner / Engineer-in-charge, well in advance in case services of any OEM (Equipment manufacturer) is required. Contractor shall do necessary coordination for mobilization of OEM specialist after obtaining permission of Owner / Engineer-in-charge.

12.10 Contractor shall furnish site acceptance test (SAT) procedures from the equipment supplier and get it approved from OWNER / EIL before carrying out the same at site.

12.11 Contractor shall prepare detailed testing, pre-commissioning and commissioning procedures for the entire installation. These shall include Performa for defining activities and recording of test results.

13.0 DRAWINGS

13.1 The drawings accompanying the tender document are indicative of the nature of work and issued for tendering purpose only. The purpose of these drawings is to enable the tenderer to make an offer in line with the requirements of the owner. However, no extra claim, whatsoever, shall be entertained for any variation between the 'Approved for Construction (AFC)' and 'Tender Drawings' regarding any changes. Construction shall be carried out as per drawings / specifications issued / approved by the engineer-in-charge during the course of execution of work. Detailed construction drawings on the basis of which actual execution of work is to proceed will be furnished to the contractor progressively based on the detailed construction program evolved after the award of work and also based on construction progress achieved by the contractor.

13.2 Prospective tenderer shall be deemed to have studied the drawings enclosed with tender or displayed for scrutiny and fully understood the nature and magnitude of the work before submitting the bids.

13.3 Where the contractor has to prepare drawings for fabrication, contractor shall submit the drawings to engineer-in-charge and the approval in writing of the engineer-in-charge shall be obtained before commencing fabrication.

13.4 After the job completion, contractor shall prepare 'As-Built' drawings. Final certified 'As- Built' drawings shall be submitted by the contractor to owner in bound volumes and in soft native files/CDs (refer instruction given in vendor data requirement document).

13.5 In addition to above mentioned as-built documents, Contractor shall provide the following documents relevant to the supplied equipment as required for operation, maintenance and staff training:

a. Design documents, certificates relating to type/acceptance/special tests, installation manuals, field testing procedures.

b. Operating instructions including description of start-up procedures and descriptions of conditions of use.

c. Maintenance instructions including preventive maintenance instructions/periodic inspection programmes, procedures for removing/replacing all parts and accessories, list of spare parts and consumables together with the information required for ordering them from manufacturers. Sub-suppliers of individual components shall be clearly identified. Communication addresses shall be indicated for each reference.

14.0 MAKE OF ELECTRICAL EQUIPMENTS

14.1 Make of electrical equipments/component shall be selected from approved vendor list attached with the tender.

14.2 Contractor shall restrict the makes of equipments / components supplied by him strictly in line with the approved vendor list.

14.3 Contractor may procure material / equipments / components from any of the approved vendor list. However current validity and range of approval as per EIL enlistment letter, workload, stability and solvency need to be verified by the contractor before placement of order.

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14.4 The equipments/items for which vendor list is not mentioned in the table of approved vendor list, contractor will propose the makes after order placement which is subject to review and approval by owner/EIL based on satisfactory track record and type test certificates to be furnished by the contractor.

14.5 Contractor shall ensure the availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply. Vendor/ sub-vendor shall give a notice of at least one year to the end user of equipment and PMC before phasing out the products/spares to enable the end user for placement of order for spares and services.

15.0 ADDITIONS / DELETIONS / MODIFICATIONS TO STANDARD SPECIFICATION

15.1 Electrical Installation Standards 7-51-0221 Rev. 6 & 7-51-0233 Rev. 1

50 Dia. GI Pipe and 100 Dia. GI Pipe mentioned wherever in the standards shall be read as 50 NB (Medium Grade) GI Pipe and 100 NB (Medium Grade) GI Pipe respectively.

16.0 LIST OF ATTACHMENTS

Sr. No.	Description	Document No.	Rev.
	DATASHEETS		
1.0	Datasheet for Lighting fixture schedule	B895-000-16-50-DS-8301	B
2.0	Datasheet for safe area LP/PP	B895-000-16-50-DS-0802	A
3.0	Datasheet for MV Switchboard fixed type	B895-000-16-50-DS-1201	A
4.0	Hardware datasheet for PDB Incomer	B895-000-16-50-DS-1211	A
5.0	Hardware datasheet for PDB Incomer with ACB	B416-000-16-50-DS-1804	B
6.0	Hardware datasheet for Contactor controlled motor feeder up to 55 KW	B895-000-16-50-DS-1811	B
7.0	Hardware Datasheet for MCCB Contactor Feeder	B895-000-16-50-DS-1813	A
8.0	Datasheet for MV Switchboard component	B895-000-16-50-DS-1802	A
9.0	Data Sheet- MV VFD (for motors >55kW & <=160kW)	B895-000-16-50-DS-3801	B
10.0	Data Sheet- MV VFD (for motors <= 55kW)	B895-000-16-50-DS-4901	B
11.0	Typical SLD for VFD with bypass (Motor rating up to 55kW)	B895-000-16-50-DS-4902	A
12.0	Datasheet for MV Induction Motor – DOL	B895-000-16-50-DS-6401	B
13.0	Datasheet for Electrical Load Data	B895-000-16-50-DS-9901	A
14.0	Data Sheet for MV power Cable	B895-000-16-50-DS-5102	A
15.0	Data Sheet for Paired Control Cables	B895-000-16-50-DS-5201	A
16.0	Data Sheet for Communication & Fire Alarm Cables	B895-000-16-50-DS-5202	A
	VENDOR DATA REQUIREMENT		
17.0	Vendor data requirement for Electrics of Building tender works	B895-999-16-50-VR-8202	A
	VENDOR LIST		

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18.0	Vendor list for Electrical equipments & components	B895-999-16-50-VL-8202	A
	STANDARD SPECIFICATION		
19.0	Specification for flameproof lighting and power panels	6-51-0008	6
20.0	Specification for medium voltage switchboards fixed type for package equipment	6-51-0012	6
21.0	Specification for industrial type control stations.	6-51-0014	6
22.0	Specification for flameproof plug socket and hand lamp	6-51-0021	6
23.0	Specification for grid connected rooftop solar photovoltaic power system	6-51-0022	1
24.0	Specification for Small MV VFD system	6-51-0049	2
25.0	Specification for medium and high voltage cables	6-51-0051	9
26.0	Specification for communication and fire alarm cables.	6-51-0052	7
27.0	Specification for hazardous area light fixtures and junctions boxes	6-51-0061	6
28.0	Specification for energy efficient medium voltage induction motors	6-51-0064	3
29.0	Specification for electrical equipment installation	6-51-0081	5
30.0	Specification for cable installation	6-51-0082	6
31.0	Specification for lighting installation	6-51-0083	6
32.0	Specification for earthing installation	6-51-0084	5
33.0	Specification for field inspection, testing and commissioning of electrical installations	6-51-0087	4
34.0	Specification for electrics of package equipment	6-51-0093	6
35.0	Design philosophy for electrical facilities	6-51-0099	7
36.0	Specification for quality management system requirement for bidders	6-78-0001	3
37.0	Specification for documentation requirement from contractors	6-78-0002	3
38.0	Specification for documentation requirement from bidders	6-78-0003	3
	INSTALLATION STANDARDS		
39.0	Symbols - single line diagrams.	7-51-0002	6
40.0	Symbols - wiring diagrams.	7-51-0011	6

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41.0	Symbols - plans (layout drawings)	7-51-0021	6
42.0	Typical earth plate and fixing details.	7-51-0103	7
43.0	Typical arrangement for earthing of motor.	7-51-0104	6
44.0	Typical earth connection for push button station.	7-51-0106	6
45.0	Fence and gate earthing (transformer yard)	7-51-0115	6
46.0	Equipment earthing schedule.	7-51-0116	9
47.0	Typical installation of open area flood light fixture mounted on wall or column	7-51-0203	6
48.0	Post top lantern installed on gate	7-51-0211	6
49.0	Typical installation of fluorescent / led fixture mounting in exposed wiring system	7-51-0212	6
50.0	Typical installation of recessed mounted fluorescent / led fixture	7-51-0213	6
51.0	Typical installation of recessed mounted or below false ceiling mounted lighting fixture.	7-51-0214	6
52.0	Typical installation of recessed mounted lighting fixture block of four.	7-51-0215	6
53.0	Typical installation of high bay lighting fixture	7-51-0216	6
54.0	Typical installation of well glass lighting fixture (safe area)	7-51-0217	6
55.0	Typical installation of bulkhead lighting fixture	7-51-0218	6
56.0	Typical installation of dispersive reflector fixture	7-51-0219	6
57.0	Typical installation of hazardous area well glass / dome glass / flat glass lighting fixture	7-51-0221	6
58.0	Typical installation of hazardous area bulk ¿ head fixture	7-51-0222	6
59.0	Typical installation of flood light fixture	7-51-0223	6
60.0	Typical installation of weather proof light fixture	7-51-0224	6
61.0	Typical installation of flame proof lighting / power panel	7-51-0225	6
62.0	Typical installation of lighting / power panel wall (surface) mounted	7-51-0226	6
63.0	Typical Installation of Lighting fixture mounting in concealed conduit system	7-51-0229	6
64.0	Typical installation of lighting / power panel flush mounted	7-51-0230	6

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65.0	Typical installation of metsec channel and lighting fixture	7-51-0232	5
66.0	Typical installation of ground level lighting fixture with precast foundation	7-51-0233	1
67.0	Typical details of switchbox / conduit for lighting switches / MCP / FCS in blast proof wall	7-51-0236	1
68.0	Typical section of RCC cable trench	7-51-0303	7
69.0	Installation details for conduit or cable support on wall / slab / beam	7-51-0305	6
70.0	Connection details for horizontal motor (cable below ground)	7-51-0313	6
71.0	Connection details for motor and control station (cable in tray)	7-51-0314	6
72.0	Installation details for socket / receptacle mounted on wall / column (cable below ground)	7-51-0315	6
73.0	Installation details for socket / receptacle mounted on column (cable in tray)	7-51-0316	6
74.0	Installation details for socket / receptacle / control station mounted on hand rail	7-51-0317	6
75.0	Safety measures for electrical installations during construction	7-51-0332	4
76.0	Details for hot dip galvanized ladder type cable trays	7-51-0333	4
77.0	Typ. installation details of electrical panels on cable trench	7-51-0336	4
	INSPECTION & TEST PLAN		
78.0	Inspection and test plan for flameproof lighting and power panels	6-81-1008	4
79.0	Inspection and test plan for MV fixed type switch board for package equipment	6-81-1012	3
80.0	Inspection and test plan for industrial type control station	6-81-1014	4
81.0	Inspection and test plan for flameproof plugs, sockets and hand lamps	6-81-1021	3
82.0	Inspection and Test Plan for for Small MV VFD system	6-51-1038	3
83.0	Inspection and Test Plan for MV and HV cables and accessories	6-81-1051	4
84.0	Inspection and Test Plan for communication and fire alarm cables	6-81-1052	4

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85.0	Inspection and test plan for hazardous area lighting fixture and junction boxes	6-81-1061	4
86.0	Inspection and test plan for energy efficient medium voltage motors	6-81-1064	1

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SCOPE OF SUPPLY / WORKS
STATIC & MACHINERY EQUIPMENT
(PACKAGED EQUIPMENT)

FOR

MISCELLANEOUS BUILDING WORKS FOR PP PROJECT

TENDER No. B895-999-81-46-CF-T-8202

PROJECT	**:**	**PMC AND EPCM SERVICES FOR POLYPROPYLENE PROJECT AT BPCL KOCHI REFINERY**
OWNER	**:**	**BHARAT PETROLEUM CORPORATION LIMITED**
PMC/EPCM	**:**	**ENGINEERS INDIA LIMITED**
EIL JOB No.	**:**	**B895**

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	06.03.2025	ISSUED AS TENDER INPUT	NJ	DV	SPC

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1.0 SCOPE

1.1 The intent of this document is to outline the Owner's requirement for design, engineering, procurement of materials and bought out components, manufacture, inspection, painting (primer + finish coat), supply, transportation, storage at site, installation, hook-up, testing, commissioning and performance guarantee of **equipment specified in this Scope of Work** as a part of Building Works Tender for Polypropylene Project at BPCL Kochi Refinery of M/s BPCL.

1.2 It is not the intent of purchaser to specify every piece of equipment/item but nevertheless any item not specifically mentioned but required as per good engineering practice and for the safe and trouble-free operation of the system shall be deemed to have been specified and in the scope of contractor, without any implication in price or schedule.

1.3 This document shall be read in conjunction with Job Specification (Static & Machinery Equipment) for Building Works Tender (Doc. No. B895-999-80-42-SP-8202).

2.0 SCOPE OF WORKS (SERVICES)

The Contractor's scope of work shall include but not be limited to the following:

2.1 Design, engineering and selection of equipment.

2.2 Procurement of raw material & bought out components.

2.3 Manufacturing and assembly at works.

2.4 Inspection & testing including third part inspection (TPI).

2.5 Surface preparation, protective coating and painting (primer + finish coat) shall be done as per painting specification attached elsewhere in the tender (Equipment painting as per Manufacturer's Standard suitable for marine coastal environment) including supply of paint.

2.6 Touch-up/ repair painting at site including supply of paint.

2.7 Insulation works for HVAC equipment for ducting, piping, equipment etc. as per EIL Standard Specification No. 6-61-0017.

2.8 Packing and Transportation.

2.9 Receipt, unloading at site, local handling, site storage, transportation from store to work site, storage at work site and assembly at site.

2.10 Erection/Installation, Mechanical Completion, hook-up, testing & commissioning.

2.11 Minor civil work including supply of material.

2.12 Performance Guarantee Test of all HVAC systems at project site.

2.13 "On-site" training at project site to Owner's personnel for operation and maintenance.

2.14 Obtaining necessary statutory approvals as required/applicable.

2.15 Preparation and submission of drawings and documents and final documents as per Vendor Data Requirement (Doc. No. B895-999-80-42-VDR-8202) included elsewhere in the tender.

3.0 SCOPE OF SUPPLY

3.1. HVAC SYSTEM

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Areas/buildings to be Air conditioned are as follows:

1. Substation JU-1& SRR-12
2. Peroxide Storage Building

3.1.1 **Central Air-Conditioning System with Water Cooled Chillers and Chilled Water Coil AHUs for following Buildings**

- Substation JU-1& SRR-12
- Peroxide Storage Building

Each System shall comprise of but not limited to the following:

(Refer SOR Item No. 01QQ.MC7.1 and 01QQ.MC7.2 of SOR No. B895-999-80-42-CF-SOR-8202-0)

Sl. No.	Quantity	Description
1.	As per **Table - 1**	Water cooled Chillers (actual capacity shall be as indicated in **Table-1**, below) comprising of scroll compressor/ screw compressor/ centrifugal compressor, electric motor for the compressor, drive package with guard, water cooled shell & tube type condenser, insulated shell & tube type evaporator, interconnected insulated refrigerant piping complete with necessary fittings, control and line accessories, cubicle type gauge panel.
2.	As per **Table - 1**	Horizontal double skin Air Handling Units (AHUs) (minimum capacity shall be as indicated in **Table-1**, below) comprising of fan section with fan, fan motor and belt drive package with guard, filter section, coil section with chilled water coil (min. 4 rows deep for normal system and min. 6 rows deep for once through system), vibration isolation pads etc. ***Special requirement for Peroxide Storage Building***: AHU with chilled water coil (min. 6 rows deep) shall be equipped with two nos. (1 working + 1 standby) centrifugal, double inlet double width (DIDW) type blowers each of 100% capacity, mounted within the fan section of the AHU. The working and the standby fans within the AHU shall be isolated by providing separate chambers with pneumatic dampers on the chamber suction and back draft damper at blower outlet to prevent short circuit of air flow, as well as to facilitate the maintenance of one blower while the other is working. Air flow switch shall be provided at outlet of the blower to sense the pressure and the blower shall be interlocked such that in the event of one blower failing the respective pneumatic damper at the suction shall close and the other blower shall start automatically with pneumatic damper open automatically so as to maintain the desired pressure/air flow in the system.
3.	1W + 1S	Chilled water recirculating pumps as per EIL Standard Specification 6-41-0003 each with CI casing, Bronze Impeller & Carbon Steel (EN-8) shaft, mechanical seal along with motors, base frames, pressure transmitter with Block & Bleed valves, Temperature sensor and transmitters with thermowells, non return valves, Y/T strainer with block and bypass valves etc. All piping / tubing for

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Sl. No.	Quantity	Description
		connection of pressure / temperature sensors shall be of SS-316.
4.	Lot	Insulated supply and return chilled water piping including fittings and valves (including 3-way modulating valve & proportionating thermostat for CHW lines) as per piping material specification attached elsewhere in the tender, instruments like pressure gauges, temperature gauges, temperature transmitter at inlet and outlet. Gate/Globe valve shall be provided in supply and return chilled water piping respectively.
5.	Lot	Cold insulation of Chilled water pumps, Chilled water supply & return piping with valves & fittings as per EIL Standard Specification for Air-conditioning System.
6.	Lot	Orifice type flow meters including weld neck flanges, orifice plate, flow transmitter, gaskets, nuts & bolts etc. for • Chilled water supply line • Cooling water supply line at each chiller • At AHU (Bypass Rotameter at chilled water supply line)
7.	Lot	Interconnecting piping, fittings, valves and accessories for Instrument air lines as per piping material specification attached elsewhere in the tender.
8.	Lot	Fresh air arrangement comprising of following: a) Intake louvers, b) Bird screen, c) Side Access chemical filter complete with fresh air fan and drive motor (1W+1S) and fresh air filters etc. d) Volume control damper, e) G.I. ducting for interconnections, f) Pneumatically operated combined fire & smoke damper. g) Fire resistant flexible connection between ducting and fresh air fan inlet.
9.	Lot	Two-stage air filtration In first stage, pre-filters shall be provided at upstream of AHU. Pre-filters shall have filtering capacity of 90% efficiency upto 10 microns. In second stage, Fine filter section comprising of 18 Gauge G.I. plenum with necessary maintenance windows, filter mounting frame, fine filter (95% efficiency down to 5 micron), Manometer across fine filters, one pressure switch and pilot light on panel to indicate dirty condition of filter. Mounting of fine filters in AHU is also acceptable. For maintenance of pre filter & fine filter, separate access door with sufficient space to be provided. Placement of pre filter and fine filter side by side is not acceptable.
10.	Lot	Insulated supply air ducting as per IS:655/SMACNA or equivalent/superior international standards complete with volume control damper, guide vanes, fire resistant flexible connection

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Sl. No.	Quantity	Description
		between AHU and ducting, duct supporting arrangement with anchor fasteners etc.
11.	Lot	Anodized aluminium supply air diffusers with volume control dampers or Anodized aluminium supply air grilles with volume control dampers. Supply air grilles in the supply air system are acceptable only if diffuser cannot be accommodated in the available space or grilles are being used in unmanned area subject to Owner/EIL approval.
12.	Lot	Anodized aluminium return air grilles/ diffusers (return air grilles to be provided all along the slits).
13.	Lot	Pneumatically operated spring return fail safe type combined fire & smoke damper in supply air and return air paths.
14.	Lot	Duct mounted strip finned electric heaters complete with heating and safety thermostat with suitable inspection window for heater maintenance.
15.	Lot	Pan type Humidifier (in stainless steel construction) to meet specified humidity requirement complete with piping, fittings, valves, float valve, immersion heater, heating thermostat, humidistat, insulation and also provided with low water level switch interlocked to water heater and float valve on make-up water line.
16.	Lot	Closed pressurized Expansion tank complete with pressurization unit, piping, fittings, valves and instrumentation.
17.	Lot	Carbon steel (IS:1239, black, heavy schedule)/ UPVC piping network with fittings to collect condensate from AHU and discharge to nearest rainwater shaft/ drain outside the building at grade level. Condensate line shall have water seal arrangement and fully insulated.
18.	Lot	Controls, Instruments and safety devices required for smooth and unattended operation of equipment/plants as per specifications attached.
19.	Lot	Plant room ventilation system.
20.	Lot	Foundation/ Fixing nuts and bolts, virgin neoprene vibration isolation pads for AHUs, Chemical Filter Unit, etc.
21.	Lot	Civil works like: a) Foundation blocks for chillers, chilled water pumps, AHUs, Chemical filters etc. b) Grouting of equipment, including supply of grouting material. c) Supply and fixing of steel supports for duct/cable/pipe/tubing etc. d) Breaking and making good of openings in wall. e) Temporary scaffolding related to erection, testing and commissioning.
22.	Lot	Structural steel works as required for equipment support and base

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Sl. No.	Quantity	Description
		frame of equipment.
23.	Lot	Electrical panels and electrical works as per electrical specification attached elsewhere in the tender.
24.	Lot	Self-standing/ wall mounted audio-visual annunciation panel for motors/ Air Heaters status and temperature/ pressure instruments/ controls as required.
25.	Lot	First fill of lubricants, refrigerant required for equipment during erection and upto successful commissioning.
26.	Lot	Commissioning Spares.
27.	Lot	Mandatory spares Mandatory Spares as per Mandatory Spares List (Doc. No. B895-999-80-42-SL-8202)
28.	Lot	Itemized list of Spare parts for two years normal operation and maintenance.
29.	1 Set	Special tools and tackles shall be minimum as per Cl. No. 8.0 of EIL Std. spec. 6-61-0017 over and above vendor's recommendation.
30.	Lot	Drawings and documents as per Vendor Data Requirement (Doc. No. B895-999-80-42-VDR-8202) attached elsewhere with this tender.

3.1.2 Configuration Of Air-Conditioning System with Floor Mounted Tower Split Air-Conditioners

- Substation JU-1& SRR-12

Each system shall comprise of but not limited to the following:

(Refer SOR Item No. 01QQ.MC8.1 of SOR No. B895-999-80-42-CF-SOR-8202-0)

Sl. No.	Quantity	Description
1.	As per **Table - 1**	Air-Cooled Split air conditioners complete with all accessories and fittings. Split unit shall have floor mounted indoor unit and remotely located air cooled condenser (outdoor unit) with insulated refrigerant piping, Controls and line accessories, Initial charge of refrigerant, Electrical and civil works (e.g. civil work related to concealing of refrigerant piping, condensate piping to the nearest drain, cabling in AC space and outside upto the outdoor unit) as required including the structural steel framework, pedestal (if required) to mount the indoor/outdoor units, supports for indoor/outdoor units, supports & clamps for refrigerant piping/cables, stabilizer, hold down nuts & bolts. Each Split Air conditioner shall be provided with 10m Power supply cable and 15m drain piping (min.). Distance between outdoor and indoor unit to be considered as 20 m (approximately)
2.	Lot	All units shall be suitable for stabiliser free operation and supplied with factory charged Non-CFC & Non-ODP environmental friendly refrigerants (i.e. R-32/R-134a/ R-407a/ R-407c /R-410a etc.).
3.	Lot	Commissioning Spares.

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Sl. No.	Quantity	Description
4.	Lot	Drawings and documents as per Vendor Data Requirement (Doc. No. B895-999-80-42-VDR-8202) attached elsewhere with this tender.

4.0 SPARES

4.1 Recommended Spares

Contractor shall furnish quotation for recommended spares for two (2) years normal operation & maintenance of the offered equipment with itemized price **after placement of order** as per Vendor data requirement (Doc. No. B895-999-80-42-VDR-8202). Recommended spares and their quantities should take into account related factors of equipment reliability, effect of equipment downtime upon production or safety, cost of parts and availability of vendor's service facilities around proposed location of equipment.

4.2 Commissioning Spares

Contractor shall supply adequate quantity of commissioning spares so as to ensure that commissioning of the system is not hampered for shortage of commissioning spares. Contractor shall include the cost of the commissioning spares in the lump sum quoted price. In case, during commissioning, any spare is used from recommended spares for two (2) years' operation and maintenance spares or mandatory spares, the same shall be replaced free of cost within a reasonable period of time.

4.3 Mandatory Spares

Contractor shall supply Mandatory Spares as per Mandatory Spares List (Doc. No. B895-999-80-42-SL-8202) attached elsewhere in the tender. Price of Mandatory Spares shall be included in the lump sum quoted price.

4.4 All spares parts shall be wrapped and packaged so that they are preserved in original as-new condition, under normal conditions of storage to be anticipated in India, and shall be properly tagged and coded so that later identification for intended equipment usage will be facilitated. The two (2) years' "recommended spares", "commissioning spares" and "Mandatory spares" shall be packaged separately and clearly marked as "Spare Parts" and "Commissioning Spares" respectively.

5.0 SPECIAL TOOLS & TACKLES

Contractor shall provide a set of new and unused special tools and tackles for each HVAC System for day to day operation and maintenance of the offered system (For AC system it shall be minimum as per clause 8.0 of Standard Specification No. 6-61-0017). Contractor shall include the cost of the special tools and tackles in his lump sum quoted price.

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Table-1 (Requirement of HVAC System)

Sl. No.	Building / Ref. Arch. Drawings/	SOR Document No. / SOR Item No.	HVAC Type	Minimum Capacity (*) of each System (Actual TR $, Min. Dehumidified Air Qty. and Min. Fresh Air Qty	Major Equipment Configuration
(A)	(B)	(C)	(D)	(F)	(G)
1.	FOR Substation JU-1 & Satellite Rack Room-12 / B895-999-81-46-12411/12412/12413	B895-999-80-42-CF-SOR-8202-0 / 01QQ.MC7.1	Central AC System with water cooled Chillers & chilled water coil AHUs.	Total Capacity: 115 TR (actual) Total Dehumidified Air Qty.: 50000 CFM (min.) Total Fresh Air Qty.: 3100 CFM (min.)	1) Water cooled Chiller: 2 Nos. (1W+1S) each of required minimum coiling capacity 115 TR 2) AHU-1 for First Floor (Substation Switch Gear Hall): 1 No. of capacity 60 TR (min.) & 23000 CFM (min.) 3) AHU-2 for Second Floor (SRR): 1 No. of capacity 55 TR (min.) & 27000 CFM (min.). 4) CFU-1: 1 No. of capacity 1700 CFM (min.) with (1W+1S) fans for First Floor (Substation Switch Gear Hall) 5) CFU-2: 1 No. of capacity 1400 CFM (min.) with (1W+1S) fans for Second Floor (SRR) 6) Chilled Water Pumps: 2 Nos. (1W+1S)
2.	Peroxide Storage Building / B895-999-81-46-13001 / 13002	B895-999-80-42-CF-SOR-8202-0 / 01QQ.MC7.2	Central AC System with water cooled Chillers & chilled water coil AHUs.	Total Capacity: 74 TR (actual) Total Dehumidified Air Qty.: 10500 CFM (min.)	1) Water cooled Chiller: 2 Nos. (1W+1S) each of required minimum coiling capacity 74 TR 2) AHU: 1 No. of capacity 74 TR & 10500 CFM (min.) (***AHU Shall be provided with Installed Stand by Fan of 100 % Capacity***) 3) Chilled Water Pumps: 2 Nos. (1W + 1S)
3.	Satellite Rack Room-12 – Rack Room	B895-999-80-42-CF-SOR-8202-0 / 01QQ.MC8.1	Floor mounted Free Standing Split Air conditioner	2 Nos. each of required minimum coiling capacity 3.0 TR	Total = 6 nos.
4.	Satellite Rack Room-12 – UPS Room			3 Nos. each of required minimum coiling capacity 3.0 TR	
5.	Satellite Rack Room-12 – Engineering Room			1 No. of required minimum coiling capacity 3.0 TR	

Notes :-

1. Legends :
   - "W" in Quantity stands for Working & "S" in Quantity stands for Standby.
   - AHU stands for Air Handing Unit.
   - PAC stands for Packaged AC Unit.
   - CFU stands for Chemical Filter Unit.
2. Contractor shall refer Architectural drawings attached elsewhere in the tender for the details of buildings requiring air conditioning. Areas to be air-conditioned shall be as marked in respective building Architectural drawings.
3. (*) The minimum plant capacity is indicated. HVAC vendor to re-check the capacity and supply in accordance with tender requirements.

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4. ($) HVAC vendor shall de-rate the machines as per the site conditions and shall select the nominal capacity of the machines to meet the actual tender requirement.
5. Complete duct work is in the scope of HVAC vendor of building Contractor. HVAC vendor shall prepare the duct layout drawings during detailed Engineering and shall submit to Owner/EIL for approval. Any comments on duct layout provided by EIL/Owner in order to meet tender requirement shall be taken care by HVAC vendor without any commercial implications.
6. The minimum static pressure of the AHU fan shall be 65 mm WC. HVAC vendor shall provide static pressure calculations for AHU fan during detailed engineering and supply the equipment accordingly.
7. Capacity of Duct strip heaters and pan humidifier shall be decided by HVAC vendor based on the approved heat load calculations.
8. Minimum quantity of Floor mounted Free standing tower Split AC is specified in the above table. Quantity of Unit may vary during detailed engineering stage. Addition / Deletion of Split AC Unit shall be done on pro data basis. Contractor to submit Floor mounted Tower AC layout during detailed engineering stage for EIL review.
9. Specific Requirement for Peroxide Storage Building: Once-through type HVAC system is to be installed for the Peroxide Storage Building, and, in this regard, the minimum Air Handling Unit (AHU) airflow (CFM) and system capacity (in Tons of Refrigeration, TR) have been specified. In the event that a higher CFM is required for the AHU design, the Contractor shall select and implement the appropriate AHU and recalculate the system's TR capacity accordingly without any commercial implication. Contractor shall bear full responsibility for ensuring the AHU design meets the necessary specifications, including any recalculations required for system capacity.

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1.0 INTRODUCTION

The Plant LAN System is to be deployed at **BPCL, Kochi.** The Plant LAN System Infrastructure in the campus across various buildings shall be capable of supporting current and future technologies. Connectivity of all user devices, Servers, PCs, Printers, Peripherals etc. shall be through 1000 Mbps or higher switched Ethernet ports. The CONTRACTOR shall procure, supply, install, test and commission the complete Plant LAN System as per scope and specifications mentioned in this document.

The LAN Structured cabling infrastructure in the buildings shall be constructed using UTP CAT-6A (LSZH-FR) cabling and components. The Fiber Connectivity between various buildings shall be through Single mode Fiber Optic cables and its associated components which include Fiber Optic Patch panels, Fiber Optic Patch cords, Connectors etc. and shall be supplied, installed and commissioned by the Contractor. It shall be the responsibility of the CONTRACTOR(s)/SUPPLIER(s) under the present tender to ensure completeness of the total System for proper functioning.

2.0 DEFINITIONS

OSAT	On-site Acceptance Tests
SYSTEM(s)	Comprising of Structured cabling components like CAT 6A UTP cables, Patch cords, Jack Panels, OFC cable (intra and Inter-building), Fiber Patch Cords, Network Racks, Connectors etc. and any other items included in this Tender.
Contractor	Supplier / Cable System Integrator
GbE	Gigabit Ethernet
FE	Fast Ethernet
LAN	Local Area Networks
Gbps	Gigabits per second
Mbps	Megabits per second
UTP	Unshielded Twisted Pair Cable

3.0 CODES AND STANDARDS

The IT Cabling Infrastructure for the campus shall be designed and installed with reference to the following Standards

- ISO/IEC 11801:2002/A1:2008 and A2:2010 Information technology - Generic cabling for customer premises (including subsequent addendums and revisions)
- ANSI/TIA/EIA Building Telecommunications Wiring Standard TIA-568-C.0,
- ANSI/EIA/TIA-568-C.1, Commercial Building Telecommunication Cabling
- ANSI/EIA/TIA-568-C.2, Balanced Twisted Pair Cabling Components
- ANSI/EIA/TIA-568-C.3, Optical Fiber Cabling
- ANSI/EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/EIA/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises
- ANSI/EIA/TIA-942 Telecommunications Infrastructure Standard for Data Centre's

4.0 GENERAL TERMS AND CONDITIONS

a) All network passive components for the LAN shall be from a **single OEM** to ensure single consolidated component warranty, cabling system performance warranty and certification by the OEM of the passive components. **LAN Solution consisting of multiple passive component OEMs shall not be acceptable**. LAN components must be intelligent, manageable and cyber security compliant.

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b) Contractor to follow LAN connectivity and standard industry practices of Information security guidelines and must ensure that entire LAN is secure reliable and compliant.

c) All products / technologies used in the LAN solution shall be Gigabit Ethernet compliant as per the relevant ANSI/ISO/IEEE/EIA/TIA/IEC standards, and the LAN shall provide end-to-end Gigabit (1 & 10 GE both) Ethernet performance.

d) It is the responsibility of the contractor to coordinate with other Contractors / Agencies / Vendors involved in the complex for proper and timely execution of work.

e) All IT equipment shall be connected through UPS power (Proper size UPS to be provided by vendor if UPS is in vendor's scope)

f) Contractor to connect the Plant LAN system with existing network of BPCL through 6 core single mode fiber optic cable in a redundant way including all material and labor and as per approved drawings specifications of this tender and directions of engineer in Charge.

5.0 DELIVERY AND INSTALLATION

On completion of delivery, contractor shall get the Bill of Material checked and signed by OWNER's co-ordinator, carry out the installation and show the SYSTEM(S) in working order and ensure that the SYSTEM(S) meets all the functional requirement to OWNER's co-ordinator at SITE.
On successful completion of the Installation and proper tuning of the SYSTEM(S), these shall be handed over to the users. Contractor shall submit the installation report along with SYSTEM(S) configuration report to OWNER's co-ordinator at Site.

6.0 FUNCTIONAL REQUIREMENT

Contractor is required to Supply, Install, Commission and Testing, drawing, documentation of Plant LAN System Including Cat-6A UTP and Single Mode Fiber Optic Structured Cabling System and Components, active Components like Switches etc. as indicated in the document to implement an active Data System Network in the Plant.

7.0 OVERVIEW OF SCOPE OF WORK

7.1 The scope shall include design, engineering, supply, installation, termination, testing and commissioning, drawing, documents of the following at all the building as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" of this document, under the scope of this tender:

a) Complete Optical Fiber Cable (OFC) backbone, interconnecting all buildings and connecting the same to existing network of BPCL through Fiber Optic Cable.

b) Ethernet Switch Racks, UTP cabling & Components for Local Area Network (LAN) connectivity within various buildings.

7.2 Scope of work shall include supply, installation, termination, integration, testing and commissioning of all equipment and items at the site(s) as per the Schedule of Rates (SOR) enclosed with the tender, drawing and documentation as indicated in this document to meet the requirements defined in specifications attached with the tender and which are required for successful completion of the work. The items and quantities have been indicated in the Schedule of Rates enclosed with the tender.

7.3 The contractor shall also integrate the Plant LAN with the OWNER's existing network.

7.4 The detailed scope of supply, installation, termination, testing and commissioning for the contractor shall be as per the following sections/clauses.

7.5 The bidder may visit the site at their own cost before bidding with prior permission of BPCL / EIL to understand the scope of the tender.

8.0 GENERAL REQUIREMENTS

8.1 The contractor shall establish a fully integrated and functional LAN at the site as per Table-1 including the supply, installation, testing and commissioning of the following:

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i). OFC backbone covering in all the BUILDINGS and connecting the buildings to existing network.
ii). Ethernet Switches in all the BUILDINGS. (in air-conditioned area)
iii). CAT-6A LAN cabling and Ethernet Switch Racks in the BUILDINGS of this tender

8.2 The contractor' scope of work shall include the design and engineering of the entire LAN solution.

8.3 The LAN shall be based on a EDGE architecture consisting of Edge Ethernet Switches, Inter-building OFC backbone and Intra-building CAT-6A UTP cabling.

8.4 The OFC backbone shall include complete OFC connectivity between existing network to all new Edge Ethernet Switches.

8.5 The Contractor shall supply all the items as listed in the Schedule of Rates (SOR) enclosed with the tender.

8.6 The contractor shall supply, install, test and commission any other material/components, although not explicitly mentioned in this document or in the SOR, but are required for completion of the work as per specifications, drawings and instruction of Engineer-in-charge to establish a fully integrated and functional LAN at the site without any additional cost and time implication to EIL/OWNER.

8.7 The Contractor shall supply only latest, and recently manufactured, unused, non-refurbished equipment / devices / components.

8.8 The Contractor shall supply all items/ accessories/ consumables (e.g. screws, straps, valcro tapes, nuts, bolts, clamps, ties, supports, grounding strips, wires, connectors, fiber connectorisation kits, cross reference cable marker/cable tags/SS name tags, PVC pipe bends/fittings, PVC flexi pipes, GI & HDPE pipe bends/fittings etc.) as necessary for the proper installation of the OFC backbone and the Ethernet Switch Racks & CAT-6A cabling & Components as per industry best practices.

8.9 All the items in the scope shall conform to (i.e. meet or exceed) the minimum technical specifications as indicated in the "Table-2: Minimum Technical Specifications" section of this document.

8.10 The contractor shall bring their own installation equipment, tools, splicing machines (kits), testers, software, computers, laptops, manpower, consumables etc. required for the installation of all the items.

8.11 The contractor shall follow OEM's guidelines and best engineering practices for the design and installation of all the devices, cabling and components etc.

8.12 The Contractor shall be responsible for protection and rectification of damage of the installed equipment, cables and systems from man, heavy equipment, rodents, insects etc. till commissioning.

8.13 Minor civil work (for successful completion of the Job) shall be included in bidder's scope without any extra cost.

8.14 The Contractor shall be responsible for cleanliness of the equipment areas till the time of final acceptance of system by EIL/OWNER.

8.15 Fully functional Wi-Fi system to be installed.

9.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF OFC BACKONE IN THE BUILDINGS

9.1 All fiber cabling system products and components shall meet or exceed the technical specifications indicated in this document.

9.2 The overall IT network with existing and new addition with all passive components, signal flow and interconnection levels and complete IP details to be prepared and submitted to BPCL for review and approval.

9.3 The scope of supply, installation, termination, testing and commissioning of the OFC backbone covering all the BUILDINGS for the contractor shall be as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" and shall include the following as a minimum:

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i). Laying of HDPE Conduit in the RCC trenches/pipe rack/existing duct/cable-trays/ raceways etc. and Laying of PVC conduits, GI Pipes within the buildings as per the SOR and various documents refereed therein, as specified in this tender

ii). Laying of OFC cable in the HDPE conduit, PVC conduits & GI Pipes as per the SOR and various documents referred therein, as specified in this tender

iii). Interconnection of various buildings in the refinery using fiber optic cable as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" attached with the tender.

iv). Installation of fiber optic patch panel, fiber optic patch cords, connectors etc. on the Ethernet switch rack in all the buildings as specified at "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity".

v). Termination of all the cores of OFC cables on fiber optic patch panels (FOPP) in all the buildings.

vi). Installation of fiber patch cords.

vii). Cable shall be dressed and terminated as per the relevant EIA/TIA standards, OEM's installation standards / practices and best industry practices.

viii). Numbering / tagging / ferruling on each rack, fiber optic patch panels, ports on the fiber optic patch panels, fiber optic patch cords etc. shall be done as per OEM's standard cable tagging and identification practices. Tags shall be of SS make only with computerized printing of letters.

ix). Each building shall be connected to SRR-11 through 6 core single mode fiber in redundant way (tentative decided, may change as per site requirement).

x). Engraved SS304 cable tag / route marker of 25mm wide and 2 mm thick at an interval of 30 meters and bending entry shall be provided on HDPE duct for identification shall be on Contractor scope and contractor shall update the route in final as built.

9.4 The scope for supplying and installing OFC cable for all inter-building OFC cabling, shall be from FOPP-to-FOPP including, but not limited to, laying of fiber optic cables in the PVC/HDPE conduits/GI Pipe, Laying of PVC conduits, Laying of HDPE conduits in the RCC trenches / cable-trays/ raceways / conduits, , Laying of GI Pipes in vertical shafts, installation of fiber optic patch panels, splicing of pig tails, termination and patching of fiber optic cables on the FOPPs, labeling / tagging / ferruling of cables, etc.

9.5 The scope shall include testing of all the cores of entire OFC cabling for all the buildings using optical time-domain reflectometer (OTDR). The OTDR measurement should follow procedure outlined in TIA/EIA 455-59, 455-60 and 455-61. All the above tests / checks shall be carried out by the Contractor internally and EIL/OWNER reserves the rights to witness the tests on random sampling basis. All Internal Test Reports and Certificates shall be furnished to EIL/OWNER for review and acceptance.

10.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF ETHERNET SWITCHES IN THE EXISTING BUILDINGS AND NEW BUILDINGS

10.1 The edge switches shall be installed at all the BUILDINGS as per Table-1 and shall have provision for OFC connectivity to any other building/network of the OWNER.

10.2 All Ethernet switches are to be managed switches.

10.3 The scope of supply, installation, testing and commissioning of the Ethernet Switch include the following:

i). Installation of Ethernet Switch in Racks in an air-conditioned area
ii). Stacking of Edge Ethernet Switches (if required)
iii). Integration with the CAT-6A LAN cabling
iv). Integration with the Fibre Optic Backbone Network and connecting to existing network
v). Switching & Routing and VLAN Configuration as per OWNER's requirements
vi). Network Device Configuration of the Ethernet Switches as per OWNER's requirements

End-to-end network connectivity testing to meet the switching and routing requirements of the OWNER

11.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF ETHERNET SWITCH RACKS AND CAT-6A LAN CABLING IN THE BUILDINGS

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11.1 The OFC backbone being commissioned by this contractor shall be connected to the LAN cabling in all the BUILDINGS as per the list provided in Table-1.

11.2 The scope of work related to the CAT-6A LAN cabling in the BUILDINGS and integration of the same with the OFC backbone shall include the following:

i). Installation of the Ethernet Switch Racks in an air-conditioned room/area.
ii). Installation of PVC conduits & PVC channels for laying and installation of UTP cables in PVC conduits and PVC channels. The PVC conduits shall be concealed. PVC channels shall be used only for surface cabling at workstation end
iii). Installation of UTP cabling and LAN Nodes in the BUILDINGS / floors in PVC conduits and PVC channels
iv). The scope for installing UTP cable shall be from rack-to-I/O including, but not limited to,
- laying of UTP cable in the PVC conduits/channels,
- installation of racks / cable managers, CAT-6A I/Os, Faceplates, Gang boxes, patch cords, jack panels,
- UTP cable termination on the jack panels and I/Os,
- fixing IOs, Faceplates & gang boxes,
- labelling / tagging of Faceplates and on Jack Panels,
- Ferruling of cables at both ends.

11.3 Parallel run of UTP cables with electrical cables to be avoided and a minimum 12inch gap to be maintained from electrical cabling. UTP & electrical cable crossing is permissible only at right angles.

11.4 One number of 42U rack shall be installed in SRR-11 (tentative location, may change as per site requirement)

11.5 UTP cabling route selection shall avoid proximity to any electrical appliance/lighting equipment etc. and minimum 12inch gap to be maintained.

11.6 The UTP cable length between the jack panel and the workstation I/O shall not exceed 90 meters.

11.7 UTP Cable route shall be indicated by the contractor in the electrical cabling drawings

11.8 Cable shall be dressed and terminated as per the relevant EIA/TIA standards, OEM's installation standards / practices and best industry practices.

11.9 Numbering / tagging / ferruling on each rack, jack panel, port on the jack panel, shall be done as per OEM's standard cable tagging and identification practices.

11.10 The CAT-6A network passive cabling architecture shall be based on the latest structured cabling standard ANSI/EIA/TIA-568B, 569.

11.11 The scope shall include the following testing prior to acceptance of the work:

i). Penta-Scanner testing of all the UTP cabling for all the BUILDINGS as per relevant EIA/TIA standards for conformance to CAT-6A requirements. All the above tests / checks shall be carried out by the Contractor internally and EIL/OWNER reserves the rights to witness the tests on random sampling basis. All Internal Test Reports and Certificates shall be furnished to EIL/OWNER for review and acceptance.
ii). Functional testing for average Round Trip Latency (using) and average Packet Loss at random nodes within and across buildings. The average round trip latency (ping response time) shall not exceed 1 millisecond and the average packet loss shall not exceed 0.5% when measured between random nodes within and across buildings.
iii). Functional testing for Switching & Routing and VLAN Configuration as per OWNER's requirements

11. WARRANTY

i). All products and services provided by the Implementation Contractor for the project shall be covered by a comprehensive warranty as mentioned in the general condition of contract document. It is the responsibility of the Contractor to ensure that all materials used for the project are sourced through authorized channels of the respective products with proper and required warranty coverage.

ii). The installed system shall be inspected by the manufacturer representative during installation and after completion of works and approved for quality and compliance to their

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best installation practices for certification at the site. Any defects identified shall be corrected at no additional cost to the Owner / EIL.

Warranty of the item/system shall be as per commercial terms and conditions. However, Application Assurance Warranty from the manufacturer of the cabling system for a period of minimum of 20 years from the date of acceptance and handover.

1.0 OTHER REQUIREMENTS

1.1 The contractor shall provide Certification of Data Communication System and submission of performance warranty of 20 years from the OEM of the passive components as per the specifications of this tender and directions of Engineer-in-Charge.

1.2 During the warranty period if the performance of the OFC backbone and/or any items in the scope of this tender degrades or if there are any manufacturing defects with the same then the defective components shall be replaced and installed by the contractor without any time and cost to the owner.

1.3 The Contractor shall submit the following documents during engineering for all SOR (SOR quantities are considered based on the engineering documents should meet the actual requirements while execution) items for review / approval by EIL/OWNER:

i). OEM datasheets for all SOR items,
ii). Test Certificates as mentioned in specifications of various items in Table-2 below,
iii). OFC and LAN component and connectivity diagram

1.4 The Contractor shall submit the following documents to EIL/OWNER during commissioning:

i). Installation Report
ii). Penta-Scanner Test Reports
iii). OTDR Test Reports
iv). Latency and packet loss test reports
v). Device configuration report (if any)
vi). As built OFC and LAN component and connectivity diagram
vii). Cable termination diagram,
viii). OEM datasheets,
ix). Test Certificates of various items in Table-2 below,
x). Detailed documentation of network including cabling layout, equipment location and bill of material etc.

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Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity

Sl. No.	Site Name	Building Name / Floor		LAN Nodes
1.	BPCL, KOCHI	BUILDINGS	SUBSTATION JP-1	11*

* Number of nodes may vary due to actual requirement of number of PC & peripherals etc.

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Table-2: Minimum Technical Specifications

S No.	MINIMUM SPECIFICATIONS REQUIRED
1.0	**Structured Cabling System with proper termination in Jack Panels and Racks for LAN Works** All passive network components quoted by the bidder should be from a **single OEM** only. All OEM of passive network components should be ISO 9001:2015 & ISO 14001:2015 Certified. Material should have been manufactured in OEM's own manufacturing facilities. All passive components should be RoHS complied. Declaration of – ROHS compliant should clearly be mentioned on data sheets of each Passive Components, or a separate RoHS declaration must be submitted. There should be minimum 20 years application assurance warranty as a part of certification of entire installed cable in plant. All Ethernet switches (Distribution, Edge) quoted by the bidder should be from a **single OEM** only
1.1 *	**Fiber Cable 6 Core single mode, armoured** **Make & Model offered**:
	Shall be 6-core Single Mode OS2, FRLSZH Single Jacket, Single Armor, Gel-free, Fiber Cable.
	Applicable Qualification Standards shall be EN 187105/ EN 50173 and Telcordia GR-20 & GR-409 (as per requirement)
	As per ITU-T G.652.D/ ITU-T G.657.A1 (Bend Insensitive), ANSI/TIA-568 C.3 (OS2).
	RoHS 2002/95/EC compliant
	Total number of fibers shall be 6, with 1 Central Loose Tube (Unitube) Design (Gel Free).
	The Fiber shall have FRLSZH outer jacket, with Corrugated Steel Tape Armoring with FRLSZH Sheath as per IEC 60332.
	The Fiber shall be Black in color to ensure UV stabilized.
	The Fiber should have protection the fiber cores from water.
	Central strength member shall be FRP Rod.
	The Fiber shall be suitable for Aerial (lashed), Indoor and Outdoor Ducts or Direct Burial applications.
	Shall be supplied with all accessories /consumables like clamps, ties etc. as per the industry standards to tie cables on trays etc.
1.2 *	**Fiber Patch Panel 12 Core Single mode** **Make & Model offered**:
	Shall have 12 nos. of ISO/IEC-11801-OS2/ ANSI /TIA-568C.3 Bend Insensitive Pigtails as per ITU-T G.652.D / G.657.A1 with LC Type connectors. Fiber Pigtails shall be Low-Smoke & Zero-Halogen IEC-60754
	Shall have all accessories including, but not limited to, the front panel, coupler plates, blanking plates, duplex LC couplers (OS2) for terminating fibres on the FOPP
	Shall be Front Patching Type, 1U high and rack mountable on standard 19" rack with mounting arrangements
	Related certification / documents to be submitted.
	Shall be supplied with all consumables for fusion splicing for termination of fibre
	Shall be made of powder coated steel.
	Shall have all necessary accessories for fibre management inside such as Fibre guides, radius controls & secure tie-downs within the FOPP
	Shall include all accessories for terminating, single mode pigtails with LC type Connectors, Splicing sleeves and splice tray

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1.3 *	**LC-LC single mode Duplex Patch cord** **Make & Model offered**:

Length shall be 3 meters
Shall be Duplex Single Mode OS2, Bend Insensitive as per ITU-T G.652.D / G.657.A1 Fiber Optic Patch Cords.
The fiber cable jacket shall be LSZH, and Riser rated. The flame test method shall be compliant to IEC 60332
Patch Cods shall be LC/UPC to LC/UPC
All patch cords shall be factory terminated and packed
Shall be RoHS compliant
The cable of the patch cord shall not be twin zip, the fiber cores shall be enclosed in a single jacket.
The polarity of the connector shall be changeable on the field without any tools

1.4 *	**Supply and Installation of OFC Joint Pits/ Splicing Enclosures** **Make & Model offered:**

Shall be a butt type enclosure with a dome and base (IP 68 Rated)
The Cable entries should be through the cable ports located in the base.
The dome and base should be sealed using a clamp with O-ring system. The cable entry ports should be sealed mechanically instead of heat shrink.
IP68 Rated
No. of Splice trays: 4 nos.
Splice Tray Capacity: 24 Fibers
No. of cable entry ports: 4 round ports and 1 oval port.
The closure should have the capability to accommodate loop cables (uncut loose tube cables)
The cables should be secured to the closure using hose clamps and a cable attachment device.
The closure should have a basket for storing loose tubes.

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1.5 *	**OFC Building Distribution Enclosure IP 54** **Make & Model offered:**

Compact Building Fiber Distribution box, wall mountable fiber enclosures for indoor and outdoor use. They are specifically designed for fast deployment and easy customer connection.
It should be easy to install
It shall be compact and flexible design
It shall have Fire retardant, LSZH materials
It shall be UV stable material for outdoor above ground use
Bottom cable seal blocks with seals for different cable types
Allows integration of passive optical components
It shall have UMS (Universal Mounting System) available to mount splice modules
Shall meet the IP55 Rated.
It shall be water and dust proof and insect proof.
No. of Splice trays: 4 no.
Splice Tray Capacity: 12 Fibers
No. of Drop cable entry ports: round ports.
Shall have 1 Mid Span Port
Shall have removable enclosure lid
Storage temperatures of -20°C to +70°C.
It should also be termite proof and provide positive sealing against dust and water.
The product and its components shall be free from any defects. Metal parts shall be corrosion resistant.
The Building Fiber Distribution Box should have the capability to accommodate loop cables/Mid Span.
The Building Fiber distribution box should be Wall mountable.

1.6 *	**Ethernet switch Rack-15U** **Make & Model offered:**

Shall be wall Mounting type
Shall have the following dimension: 550(W) X 600 (D) X 15 U (H)
Shall conform to DIN 41494 / EIA- 310
Shall be Powder coated steel cabinet and cabinet colour shall be black RAL 9005
Shall have Locking arrangement as per OEM standard
Shall have 19 inch rail equipment mounting frame with notches at regular intervals for mounting equipment's as per industry standard
Shall have Front door with glass cover
Shall be provided with 2 Nos. Horizontal cable manager
Shall have 2 nos. Brushless fans with fan tray mounted on the top cover for equipment cooling
Shall have 2 nos. Power distribution Units (PDUs) strips each with 4 nos. 3-pin socket 16/6 A, 230 V AC power outlets and cabinet Earthing / grounding facility shall be provided
Shall have ventilation louvers or uniform perforation on side panel and rear door
Shall have Steel top cover and bottom panels with cable entry facilities
Shall have accessories (such as nuts, bolts, washers, clip-on nuts for equipment mounting etc.) and assembly hardware
LED light shall be provided in cabinet

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1.7 *	**Pre lubricated HDPE PLB Duct - ISI Approved** **Make & Model offered:** HDPE (High Density polyethylene) telecom ducts for use as Optical Fibre Cable ducts. Smooth inside & outside surface free from blisters, shrink, hole, scratches & roughness Outer diameter: 40 +/- 0.4 mm Color – Yellow with Black stripe Length - 500 Meter Roll Accessories: Coupler, End Plug, Endcap shall be included Suitable for direct burial applications Manufacturer Company should be ISI certified
1.8 *	**PVC conduit pipe with accessories** **Make & Model offered:** Construction - Both the surface should be smooth and free from burrs Maximum OD - 32.00 MM ISI Marked
1.9 *	**PVC channel with accessories** **Make & Model offered:** Maximum OD - 25.00 MM ISI Marked
1.10 *	**CAT 6A LSZH UTP cable 305m box** **Make & Model offered** The UTP Cat 6A Gigabit copper cable as per ANSI/TIA-568C.2 4-pair, Cat 6A U/UTP Cable, Category-6A with ETL 4 connector channel test/equivalent report as per ISO/IEC 11801, 23 AWG bare solid copper. ETL 4 Connector channel Test report, Performance ETL/equivalent Verified Certificate. RoHS Compliant. Sheath should be LSZH as per flame rating standard IEC 60332. PAIRS with Standard Color Code & length: 305 Mtrs. (1000 ft.)
1.11 *	**CAT 6A Jack Panel - 24 port** **Make & Model offered**: Shall be loaded with 24 nos. Category-6A I/O complying with TIA-568 C. Cat 6A U/UTP Jack Panel should be UL Listed, RoHS Compliance Shall be 19” rack mountable and of 1U/2U height & complete with all mounting accessories. Shall have rear cable management features, shall be loaded and shall have termination manager for proper termination of cables at rear. Shall have Comprehensive individual port numbering on front. Shall be supplied with Rear cable management as a standard accessory and this shall only occupy the same space as the panel. The patch panel type shall be a 1U panel capable of supporting 24 unshielded modular 8-pin connectors compliant with IEC 60603 while meeting the Channel Performance. Panel shall be made of High-impact, flame retardant, thermoplastic and Powder coated steel.

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1.12	*	**CAT 6A LSZH Modular Patch Cord-3FT** **Make & Model offered:** All patch cords shall conform to Category-6A as per the ANSI /TIA-568C.2 Shall support network line speeds up to 10 Gbps Shall have factory crimped RJ-45 jacks at both the ends and length should be available in feet/meter The Patch cords shall be solid core construction to provide superior performance. Shall be compliant with ISO/IEC 60332 ETL/UL/equivalent Electrical performance testing of telecommunications patch cords to the requirements ISO/IEC 11801 for Category 6A patch cords shall be submitted.
1.13	*	**CAT 6A LSZH Modular Patch Cord-7FT** **Make & Model offered:** All patch cords shall conform to Category-6A as per the ANSI /TIA-568C.2 Shall support network line speeds up to 10 Gbps Shall have factory crimped RJ-45 jacks at both the ends and length should be available in feet/meter The Patch cords shall be solid core construction to provide superior performance. Shall be compliant with ISO/IEC 60332 ETL/UL/equivalent Electrical performance testing of telecommunications patch cords to the requirements ISO/IEC 11801 for Category 6A patch cords shall be submitted.
1.14	*	**CAT 6A I/O** **Make & Model offered**: Cat 6A UTP Jack PCB/PWB based Information Outlet (I/O) RJ45, TIA-568 C.2 Category-6A. UL Listed, ETL Channel test report as per ISO/IEC 11801, ANSI/TIA 568 C.2. High-impact, flame-retardant, UL- RATED 94v 0 thermoplastic – ABS, Plug Insertion Life Min. 750 times as per IEC 60603. The information outlet must support 90-degree cable termination, RoHS compliant. Cat 6A UTP Jacks should be available in different colors for easy identification.
1.15	*	**CAT 6A Face plate including Gangbox** **Make & Model offered**: Shall be (RJ45) square plate, dimension as per commercially available modular office furniture. Shall have spring shuttered front access for preventing ingress of dust. Shall Supply Gang Box of the same size. Safety Standard UL/ETL/equivalent Listed, RoHS Compliant. Shall have Write on labels in transparent plastic window along with the plate. Shall have Screw hole covers along with the plate. Shall be able to support variety of jacks – CAT 5e / CAT 6 / CAT 6A UTP
2.0		**Active Components**
2.3	*	**Access Switch-24 Port** **Make & Model offered:** **Specifications** Minimum 24 x 10/100/1000 Base-T PoE+ and 4 x 1/10G ports DAC/Stack cable to be provided to achieve MLAG/Stacking/virtual-chassis

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128Gbps or higher Backplane capacity and minimum 95 Mpps of forwarding rate
Should support Non-blocking hardware architecture, all proposed ports must provide wire speed line rate performance. Switch should have trusted modules/mechanism for secure OS boot/authentication process or secure boot process
All interfaces should provide wire speed forwarding for both Fiber and copper ports
The Switch should have minimum 360 W PoE Budget
The switch should support IEEE802.3af and IEEE802.3at on all ports.
Support for VLANs, IPv4 routes, MAC address
It should support IGMP snooping v2 & v3
It should have static IP routing, RIP and OSPF from Day-1 Switch should support VXLAN with L2VNIs
Switch should support 8 hardware queues per port Switch should support ACL entries IPv4 and IPv6
Switch should support Strict priority queuing / WRED/DWRR or equivalent
Switch should support streaming/Flow Based telemetry capability
Should support IPv4 and IPv6 security features
Should support Secure Shell (SSH) Protocol and Simple Network Management Protocol Version 3 (SNMPv3).
Switch needs to have dedicated OOB 1G port, console cable and 19" rack mounting kit to be provided along with.
SFTP/SCP for upgrading the operating System
IEEE 802.1x support, IEEE 802.1D Spanning-Tree Protocol, IEEE 802.1p class-of-service (CoS) prioritization, IEEE 802.1Q VLAN
SNMP v1,v2,v3, sflow/netflow, NTP/Precision time protocol
Switch should be manageable through both IPv4 & IPv6.
Certification
The Switch Series/Switch OS Series should be EAL 3 or above/NDPP/ NDcPP certified under Common Criteria. Offered Switch/Switch series shall be certified for Mandatory Conformance (MTCTE - Mandatory Testing and Certification of Telecommunication Equipment) issued by TEC (Telecommunication Engineering Centre), DoT.
Warranty and Support
The below Warranty and support shall be offered directly from the switch OEM.
The OEM should have TAC centre in India and also 24x7 TAC support with Indian Toll free number – reflected in official website/documents. NBD support to be provided.

All necessary items like licenses, management modules, hardware such as 3-pin power cords suited to Indian environments, console cables, hardware, cables, connectors, mounting rails, clamps and any other required accessories for mounting in rack, supports, fittings etc. required for installation of the switch shall be included in the supply

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2.5 *	**10G SFP+ LR Upto 10 Km** **Make & Model offered**:

Transceiver Type SFP+
Product Type Optical
Transceiver Connector Duplex LC
Signaling rate, each lane 10 Gbps
Transmitter fiber SMF
Transmitter wavelengths (range)1260 nm to 1355 nm
Transmitter output power, each lane (minimum)–8.2 dBm
Transmitter output power, each lane (maximum)0.5 dBm
Receiver input power, each lane (minimum)-14.4 dBm
Receiver input power, each lane (maximum)0.5 dBm
Core size/cladding, 9/125 µm
Distance up to 10 km
Operating Temperature (range) 0° C to 70° C
Storage temperature –40° C to 85° C
The Transceiver should be of the same OEM as that of the switches

2.6*	**Wi-Fi Access Point - Indoor** **Make & Model offered**:

Access Points must support Wi-Fi 6 (802.11ax) with Dual radios (2.4GHz, 5GHz) with integrated antenna and required mounting kit.
AP must support the 802.11a/b/g/n/ac /ax
Must have minimum 1x GbE and 1x 2.5GbE or one smart rate/Multi-gigabit up to 5Gbps auto-sensing port. Access point should have USB support.
Access point should support operating temperature of atleast 0 to 50°C
Must support minimum 4x4 with four spatial streams (MIMO) on 5Ghz band and 2x2 with 2 spatial streams (MIMO) on 2.4Ghz band.
Access Point should support minimum 2.9 Gbps or more MCS/Phy data rate including both the radio
Access points Radio maximum conducted transmit power shall be 20 dBm or more or as per approved by Indian regulatory more on both 2.4 and 5 GHz
Access point antenna gain should be 3dBi or more on both the radios
The wireless solution should be capable to work with local / external DHCP Server, Captive Portal and AAA/authentication server.
Must have an dynamic or smart RF management features which allows WLAN to automatically and intelligently adapt to changes in the RF environment
The WLAN solution should have comprehensive integrated security features that include layer 2-7 stateful packet filtering firewall/Application or URL filtering firewall for branch and remote offices.
The access point should provide wireless IPS Sensor capabilities, IP filtering, WPA2, WPA3 and NAT support.
Wireless solution must provide WIPS, Rogue AP detection, air termination of Rogue APs.
WLAN solution should provide features that provides no touch AP discovery, adoption, provisioning
WLAN solution should provide features that provides other management functions including firmware push and statistics
Must support telnet and/or SSH login to APs directly for troubleshooting flexibility
Support for Voice-over-wireless LAN (VoWLAN) quality of service (QoS) ensures toll quality, even with many simultaneous calls on a single access point. Should be able to support 30 VoIP devices using Voice calls with enterprise grade SLA
Access point should be UL2043 - Plenum Rated, 802.3af and 802.3at support. Access point should be Wi-Fi Certified

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	AP should support IAP / Unleashed / Autonomous / EWC (embedded wireless controller) / equivalent mode
	The OEM product shall be certified for Common Criteria / NDcPP/NDPP/EAL 3 for IT security Evaluation. The quoted product should be MTCTE Certified as per TEC, Govt. Of India.

* -> Item quantities are tentative in nature which may vary and shall be procured and installed as per actual requirements at site on unit rate basis. All Active components (switches) shall be from **same OEM** and all passive components (copper and fiber) shall be from **same OEM**.

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Scope of Work and Job Specifications for Composite Works – CIVIL AND STRUCTURAL WORKS FOR PP PROJECT BPCL KOCHI (Digital Technology Solutions)

PROJECT	:	**PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**
OWNER	:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC / EPCM	:	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	:	**B895**

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	15.01.2026	ISSUED FOR COMMENTS	AR	AKP	SB

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CONTENTS

Cover page 1

1.0 GENERAL 3

2.0 SCOPE OF WORK/SUPPLY 3

3.0 JOB SPECIFICATIONS 6

3.1 PROJECT CONTROL TOWER (PCT) & COMMON DATA ENVIRONMENT (CDE) 6

3.2 4D MONITORING 7

3.3 APP BASED DIGITAL SAFETY MANAGEMENT SYSTEM (DSMS-APP) 7

3.4 AUTOMATED MANPOWER PRODUCTIVITY SYSTEM (MANPS) 8

3.5 AUTOMATED MACHINE PRODUCTIVITY SYSTEM (MACPS) 10

3.6 WAREHOUSE MANAGEMENT SYSTEM (WMS) 11

3.7 TRANSPORT MANAGEMENT SYSTEM (TMS) 11

3.8 SPOOL MANAGEMENT SYSTEM 11

3.9 COMMON SYSTEM FEATURES & FUNCTIONALITIES 11

4.0 ADHERENCE TO STANDARDS 11

4.1 QUALITY, SAFETY, DOCUMENTATION AND CYBERSECURITY 11

5.0 INTEGRATED ACCEPTANCE TEST (SAT) 12

6.0 LIST OF ATTACHMENTS 12

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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 for Digital Safety Management (App Based) 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	Project Control Tower/ Common Data Environment (PCT/CDE) – Provisioning and Implementation.		Yes
2.1.2	Project Control Tower/ Common Data Environment (PCT/CDE) – Support.	Yes	
2.1.3	4D Monitoring Solution – Provisioning and Implementation.		Yes

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2.1.4	4D Monitoring Solution – Support	Yes	
2.1.5	App Based Digital Safety Management System (DSMS-APP) – Provisioning and Implementation.		Yes
2.1.6	App Based Digital Safety Management System (DSMS-APP) – Support.	Yes	
2.1.7	Automated Manpower Productivity System (MANPS) – Provisioning and Implementation		Yes
2.1.8	Automated Manpower Productivity System (MANPS) – Support.	Yes	
2.1.9	Automated Machine Productivity System (MACPS) – Provisioning and Implementation		Yes
2.1.10	Automated Machine Productivity System (MACPS) – Support.	Yes	
2.1.11	Warehouse management system (WMS) – Provisioning and Implementation. (Note-3)	NA	
2.1.12	Warehouse management system (WMS) - Integration with Purchaser's CT/CDE.		NA
2.1.13	Transport Management System (TMS) – Provisioning and Implementation.	NA	
2.1.14	Transport Management System (TMS) - Integration with Purchaser's CT/CDE.		NA
2.1.15	Spool Management System – Provisioning and Implementation *(Where Spool Fabrication at site is in Bidder's Scope)*	NA	
2.1.16	Providing Mobile Devices (Smart Phones) to Bidders concerned personnel, for use of DSMS-APP, PCT/CDE .	Yes	
2.2	**Coordination**		
2.2.1	Coordination with • Purchaser • PMC/EPCM • Purchaser's CT/CDE Vendor • Purchaser's Managed Service Provider (MSP) for DSMS-App, MANPS and MACPS Digital Solutions • Sub-vendors of Digital Solutions Implemented by Bidder.	Yes	
2.3	**Training**		

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2.3.1	Training for Spool 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 and Warehouse Management System.	Yes	
2.5	**Cyber Security Requirements**		
2.5.1	Cybersecurity Compliance as per Cybersecurity guidelines for Spool 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. 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
    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. Deleted
3. Deleted.
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 for a tender based on nature of job / tender conditions / scope of work.
7. PMC is having responsibility of overall project progress monitoring and will be actively engaged with the bidder for successful utilisation of the digital solutions.

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3.0 JOB SPECIFICATIONS

3.1 PROJECT CONTROL TOWER (PCT) & COMMON DATA ENVIRONMENT (CDE)

3.1.1 System Overview

3.1.1.1 Purchaser intends to deploy a Control Tower/CDE 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 PCT-CDE (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 PCT/CDE. Data is provided by bidder through excel or manual entry or templates or online forms etc which will be provided by purchaser. For seamless integration between bidder's Primavera P6 EPPM or MS Project and PCT/CDE, bidder shall provide necessary plug-ins in their side.

3.1.3 Bidder shall provide all support, assistance and guidance to Purchasers CT/CDE Vendor to integrate the Bidders Systems (as required) with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period. This includes making changes to Bidders Systems (if required).

3.1.3.1 Bidder shall be provided 1-2 No. User Id's to access the PCT System for providing input.

3.1.3.2 As a minimum bidder shall provide data for KPIs in CT-CDE as per Annexure-1-KPI List.

3.1.3.3 Bidder shall be responsible for complying with the workflows as defined in the PCT-CDE.

3.1.3.4 Bidder shall nominate representatives to attend mandatory PCT-CDE training sessions and achieve proficiency in use of the same.

3.1.3.5 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.

3.1.3.6 As a minimum bidder shall provide data for following KPIs in CT-CDE. Bidder shall also provide any other information in the PCT System or any other system as directed by the Engineer-In-Charge:

i. Project Schedule including Project Critical Path, Near Critical Path/Activities- Tabular and Gantt Chart Format (Native P6 EPPM Files)
ii. Project Progress Status- Sch/Act- S-Curves at Unit , Functional, Major Subcontract Level
iii. Drawings Status- Sch/Act
iv. Procurement Status- Sch/ Act
v. Tendering Status- Sch/ Act

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vi. Construction Status- Sch/ Act
vii. Critical Issues (along with Action Plan/ Target Dates/ Issue Status/ Issue Ranking etc.)
viii. HSE Statistics
ix. Deleted.
x. Resource (Manpower/ Construction Machinery) Deployment at Site
xi. Deleted
xii. URL's for tracking Physical Location on Critical Equipment, Long Lead Items (LLI's) during transit from Vendor Works to Site.

3.1.3.7 Bidder shall comply with the CT-CDE data security protocols and ensure that only authorized personnel access the system using approved devices.

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, colour 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 PCT-CDE/ P6 EPPM or MS Projects for the unit. In all other cases, bidder shall provide information to support 4D implementation and update by providing information in the relevant system and in formats as directed by the Engineer-In-Charge.

3.2.3 Bidder has to prepare schedule in such a manner that activities/ tasks can be mapped to 3D model elements.

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 APP BASED DIGITAL SAFETY MANAGEMENT SYSTEM (DSMS-APP)

3.3.1 Solution Overview

3.3.1.1 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.

3.3.1.2 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

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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.

3.3.2 **Bidders Obligations**

3.3.2.1 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.

3.3.2.2 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.

3.3.2.3 Bidder shall nominate representatives to attend mandatory DSMS-APP training sessions and achieve system proficiency within one month of deployment.

3.3.2.4 Bidder shall facilitate full compliance with the use of DSMS-APP for safety violation reporting, good observations reporting, resolution tracking, and emergency notifications.

3.3.2.5 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.

3.3.2.6 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.

3.3.2.7 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.

3.3.2.8 Bidder shall actively monitor dashboards and reports generated by DSMS-APP to track unresolved issues and compliance trends, ensuring timely compliance.

3.3.2.9 Bidder shall utilize DSMS-APP to raise real-time alerts in emergencies requiring immediate action, providing accurate location data for response teams.

3.3.2.10 Bidder shall comply with the DSMS-APP data security protocols and ensure that only authorized personnel access the system using approved devices.

3.3.2.11 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.

3.4 AUTOMATED MANPOWER PRODUCTIVITY SYSTEM (MANPS)

3.4.1 **Solution Overview**

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3.4.1.1 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.

3.4.2 **Bidders Obligations**

3.4.2.1 Bidder shall support implementing MANPS by their employees and vendors'/ sub-contractors' employees and by utilizing the application.

3.4.2.2 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.

3.4.2.3 Bidder shall provide monthly projections of worker mobilization and demobilization for the next two months to ensure smooth operations.

3.4.2.4 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.

3.4.2.5 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.

3.4.2.6 Bidder shall nominate representatives to attend mandatory MANPS training sessions and achieve proficiency in use of the same.

3.4.2.7 Bidder shall provide distribution of workers based on work allocation in the MANPS package.

3.4.2.8 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.

3.4.2.9 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.

3.4.2.10 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.

3.4.2.11 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.

3.4.2.12 Bidder shall ensure all workers comply with the MANPS usage protocols.

3.4.2.13 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

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the MANPS system, with compliance with relevant data protection regulations and project guidelines.

3.4.2.14 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.

3.4.2.15 Bidder shall coordinate their site works with purchaser's MANPS Solution Provider.

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

3.5 AUTOMATED MACHINE PRODUCTIVITY SYSTEM (MACPS)

3.5.1 Solution Overview

3.5.1.1 Automated web-based Machine Productivity System, hosted in MeitY empanelled cloud data centre, will be provisioned and implemented by purchaser. The digital solution will be used for tracking of construction machine productivity including GPS location tracking and utilization (running and idling condition) by deploying/installing a IOT Sensor on the Bidders Construction Equipment like Excavators, Bulldozers, Pavers, Dump Truck, Compactors, Backhoe Loader, Graders etc. System will also be capable to record other information like Equipment Details, Capacity etc.

3.5.2 Bidders Obligations

3.5.2.1 Bidder shall furnish a comprehensive list of all construction equipment, and enter all the relevant details like machine type, Equipment Details, Capacity, Operator Name and details, Contractor Name and Details, Sub-contractor Name and Details, Valid Certification, due date of renewal, permissible load as per the load chart for cranes etc. to enable registration in the MACPS system.

3.5.2.2 Bidder shall nominate personnel responsible for coordinating with the MACPS solution provider for installation, system configuration, and addressing queries related to equipment tracking and productivity monitoring.

3.5.2.3 Bidder shall provide access to construction equipment for the installation, inspection, and maintenance of IoT devices by the MACPS solution provider and ensure the availability of equipment at designated locations as agreed with the purchaser/ MACPS solution provider.

3.5.2.4 Bidder shall provide Power Supply suitable for IoT Devices/ Sensors for MACPS in the respective construction equipment. This includes undertaking suitable modifications/ additional wiring etc in the construction equipment as required.

3.5.2.5 Bidder shall obtain explicit consent from construction equipment owners/ operators for data collection, usage and processing within the MACPS system, ensuring compliance with relevant data protection regulations.

3.5.2.6 Bidder shall cooperate fully with the MACPS solution provider during IoT device installations and ensure that no unauthorized tampering or interference occurs with the devices or associated systems.

3.5.2.7 Bidder shall be responsible for the safekeeping of IoT devices installed on their equipment and report any loss, damage, or theft to the purchaser/ MACPS solution provider promptly.

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Bidder shall bear the cost of replacements (actual cost of IOT Devices incurred by BPCL), as applicable.

3.5.2.8 Bidder shall ensure that their operators and supervisors are aware of and comply with operational guidelines for construction equipment monitored through the MACPS system.

3.5.2.9 Bidder shall utilize the MACPS dashboards and reports provided by the MACPS solution provider to track construction equipment location, utilization and compliance with project requirements, implementing corrective actions as needed.

3.5.2.10 Bidder shall nominate representatives to participate in compulsory training sessions conducted by the MACPS solution provider to understand the use of MACPS features, including dashboards, KPI monitoring, and productivity reporting.

3.5.2.11 Bidder shall facilitate coordination between construction equipment operators and the MACPS solution provider to address any operational constraints or challenges during system implementation.

3.6 WAREHOUSE MANAGEMENT SYSTEM (WMS)

Section Deleted. However, Bidder to follow relevant specifications for material management , control and reconciliation as may have been specified in other parts of the tender.

3.7 TRANSPORT MANAGEMENT SYSTEM (TMS)

Section Deleted.

3.8 SPOOL MANAGEMENT SYSTEM

Section Deleted.

3.9 COMMON SYSTEM FEATURES & FUNCTIONALITIES

Not Applicable

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: As per 3.9.1 above.

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5.0 INTEGRATED ACCEPTANCE TEST (SAT)

Not Applicable

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.

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STANDARD SPECIFICATIONS FOR ARCHITECTURAL WORKS (GENERAL)

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
7	08.02.22	REAFFIRMED AND ISSUED AS STANDARD SPECIFICATION	ANISH MAHALA	ANISH KUNDU	SAMIR DAS	SANJAY MAZUMDAR
6	20.03.17	REAFFIRMED AND ISSUED AS STANDARD SPECIFICATION	PD	JS/ JKB	R. SRIVASTAVA	R.NANDA
5	15.03.12	REVISED AND ISSUED AS STANDARD SPECIFICATION	PD	SD	JKB	D. MALHOTRA
4	21.03.07	RENAMED & ISSUED AS STANDARD SPECIFICATION	SD	JKB	ARVIND KUMAR	V. CHATURVE
3	11.03.99	REAFFIRMED AS STANDARD SPECIFICATION	SD	MLB	SCJ	AS

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Abbreviations:

ASTM	:	American Society for Testing and Materials
BS	:	British Standards
BIS	:	Bureau of Indian Standards

Structural Standards Committee

Convener: Mr. Samir Das

Members:
Mr. Rajesh Gujral
Mr. Anish Kundu
Mr. Sandeep Sharma
Mr. Maitrayee Majumder (Strl)
Mr. Charanjeet Singh (Projects)
Mr. Ravindra Kumar (Construction)

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CONTENTS

1.0 GENERAL 4
2.0 DEFINITIONS 4
3.0 CODES & SPECIFICATIONS 4
4.0 MANUFACTURER 4
5.0 CONFLICTS & CONTRADICTIONS 5
6.0 MATERIALS 5
7.0 WORKMANSHIP 6
8.0 PACKAGING, SHIPPING, DELIVERY & STORAGE 6
9.0 SUBMITTALS 6
10.0 MEASUREMENT 7

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1.0 GENERAL

This specification establishes and defines various aspects of specifications of Architectural works such as codes, references, manufacturer, conflicts and contradictions, materials, workmanship, packaging, shipping, delivery and storage, testing, submittals and measurement etc. and shall be applicable for all the Architectural specifications.

2.0 DEFINITIONS

2.1 Contractor

The party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of the Project. Contractor includes its approved Manufacturers, Vendors, Suppliers, and subcontractor's. Requirements of this specification shall be enforced at all levels of the Contractor's design, engineering, procurement, construction process.

2.2 Subcontractor

The party which is engaged by the "Contractor" and carries out all or part of the design, engineering, procurement, construction of the system (s).

2.3 Manufacturer/ Supplier/ Vendor

The party which manufactures and/or supplies equipment, materials, technical documents/ drawings and services to perform the duties specified by the "Contractor".

2.4 Shall

Indicates a mandatory requirement.

2.5 Should

Indicates a strong recommendation to comply with the requirements of this document.

3.0 CODES & SPECIFICATIONS

3.1 Codes and standards as indicated in the specifications form a part of specifications. When an edition date is not indicated for a code or standard, the latest edition and addendum or amendment in force at time of contract award shall apply.

3.2 Alternate codes and standards meeting the requirements of the referenced codes and standards may be used with the approval of the competent authority.

3.3 It shall be Contractor's responsibility to be, or to become, knowledgeable of the requirements of any referenced codes and standards.

4.0 MANUFACTURER

4.1 Name of the Manufacturers of products included in the tender documents are the acceptable Manufacturers for the particular product provided the products meet the requirements specified in the tender documents. Products by other Manufacturers which are of equal quality and performance and meet the specified requirements may be considered for approval upon review of information as required and submitted to the competent authority. However the contractor to ensure that the time schedule is adhered to in any case.

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4.2 Product data sheet, specifications, performance data, installation instructions and other recommendations of such approved Manufacturers also form part of the specifications provided that these are not in contradiction with other specified requirements.

4.3 Materials, installation method and other requirements for execution of any item if required by Manufacturer's installation instructions, recommendations and requirements shall also form part of the specifications whether specified or not.

4.4 In case, name of particular Manufacturers are mentioned in specification/ drawing/ item descriptions etc. the purpose is to set example of desired quality of the product. Product of other manufacturers having similar quality (in the opinion of Engineer- in- Charge) may also be considered.

5.0 CONFLICTS & CONTRADICTIONS

5.1 Specifications, Scope of Work, Schedule of rates and drawings for a particular Tender shall be read in conjunction with each other. In case of conflicts/ contradictions amongst them, the clarification shall be obtained from the Engineer-In-Charge whose decision shall be final & binding. Following procedure shall be followed for the necessary clarification.

5.2 Item description shall prevail over specifications for item rate tenders when provisions therein are different from those in specifications. Whenever any requirement is not covered in item description but are covered in specifications, the specifications shall be followed in addition to the requirements of item description .No extra payment shall be made to the Contractor for executing such item as per specification.

5.3 Whenever drawings call for requirements different from or additional to those in item description and specification, the decision of the Engineer-In-Charge shall be obtained in writing. However no extra payment shall be made to the Contractor for executing any work incorporating requirements additional to those in item description and specification but covered in applicable drawings or standards attached to the tender.

5.4 Any conflict between drawing, item description, specification etc. shall be got resolved by the Contractor from the Engineer-In- charge in writing before execution.

6.0 MATERIALS

6.1 All materials shall be of standard quality conforming to the specifications and other requirements of tender document and shall be obtained from the approved Manufacturer.

6.2 The Contractor shall get the samples of materials approved by the Engineer-In-Charge before ordering & procurement. Such approved samples shall be properly marked/ identified as approved sample and shall be kept as record for future reference.

6.3 Contractor shall arrange the samples along with necessary documentation, test certificates etc. so that the compliance with the specifications etc. can be ascertained.

6.4 Contractor shall arrange mock-ups if asked by the Engineer-In- Charge to facilitate approval of the samples.

6.5 Samples shall be approved subjected to compliance with specifications etc. Finishing, colour, texture and other aesthetic aspects shall also be considered for finishing/ interior items.

6.6 Contractor shall get the materials tested from approved test house if and as asked by the Engineers-In-Charge & submit the test certificate at his own cost for which no extra payment shall be made to him.

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6.7 The Engineer-In-Charge shall have the right to reject all or any of the materials intended to be used and such materials shall be immediately removed from the site by the Contractor at his own cost without any claim for compensation etc. due to such rejection.

7.0 WORKMANSHIP

7.1 Workmanship shall be in accordance with relevant codes or in accordance with Manufacturer's recommendations as approved by the Engineer-in-charge if not specified otherwise.

7.2 All work shall be executed to the complete satisfaction of the Engineer-in-charge. Necessary rectification etc. shall be done by the Contractor at no extra cost for works not accepted by the Engineer-in-charge until the work is accepted by him.

7.3 All works shall be done by qualified Contractors who have adequate equipment and skilled workers. All specialized items of work (e.g. Aluminium Doors and Windows, Waterproofing, Underdeck and Overdeck Insulation, roof sheeting/ cladding, False ceiling, False Flooring, Partitioning and Panelling, Expansion joint sealing, Fire Check Doors, Structural Glazing, Aluminium Composite Panels etc.) shall be got executed by the Contractor only through authorised applicators/ sub contractors of approved Manufacturer/ vendor or as approved by the Engineer-In-Charge.

7.4 All precaution and protection shall be taken during & after completion of work to prevent damages to work being done and other works. Any damages done shall be rectified by the Contractor at no extra cost.

7.5 Work area shall be cleaned after completion of each work and shall be kept clean and protected till final acceptance by the competent authority.

8.0 PACKAGING, SHIPPING, DELIVERY & STORAGE

8.1 All material shall be delivered in Manufacturer's original package bearing the name of the Manufacturer, product colour and pattern name, identification number and other related information.

8.2 All materials shall be stored, preserved and protected to safeguard against all adverse environments such as humidity, moisture, rain, dust, dirt, sand, mud, salt air, salt spray and sea water.

8.3 Specific requirement of packaging, shipping, storage and preservation and safety of materials/ items if any as per Manufacturer's recommendation shall also be ensured by Contractor.

8.4 Materials damaged in handling and storage shall not be used. In the event that any material for use deteriorates and become unusable due to inadequate and poor storage they shall be removed from site as instructed by Engineer-in-charge and replaced at the Contractor's expenses.

9.0 SUBMITTALS

If not mentioned otherwise, Contractor shall submit the following.

9.1 Samples

9.1.1 Samples of materials, components, accessories and complete range of finishing/ shades/ colours for verification as well as acceptance of pattern, colour and finish as applicable.

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9.1.2 Samples shall be re-submitted until approved. Approved samples shall be retained as mentioned in clause 6.0

9.2 Test and BIS Certificates

9.2.1 All applicable tests shall be conducted by the Contractor at no extra cost. Test Certificates shall be submitted for review/ approval of the Engineer-in-charge.

9.3 Shop/ fabrication Drawings

9.3.1 Shop or fabrication drawings indicating large scale details, lay-out, connections, anchoring, fastening, bracing, finishes etc. as applicable for review/ approval.

9.3.2 These drawings shall be prepared to achieve the desired design and quality of work expressed in design, drawings and specifications etc..

9.4 Product Information and Manuals

A. Product information (Technical).
B. Manufacturer's recommended installation instructions.

9.5 List of applicators/ Sub contractors

Contractor shall submit list of applicators/ sub contractors of specialized items of works along with there past track report for review/ approval before execution of such items.

9.6 Maintenance manuals

In case of specialized items, contractor shall submit the Operation & maintenance manual including guarantee/warranty card and its validity document.

9.7 Deviations

9.7.1 Deviations if any shall be raised and processed in accordance with conditions mentioned in the tender document.

9.7.2 Deviations shall be submitted before procurement and execution. Procurement, execution and other related works shall be taken up only after the deviation is accepted by the Engineer-In-Charge. Post facto approval of deviation shall not be entertained and Contractor himself shall be responsible for any procurement/ execution of any work or any action which are deviations and for whose, prior approval is not obtained.

9.8 Sample mock-up work

Contractor shall prepare mock-up work of specialized items or systems as specified or asked by the Engineer-In- Charge. Mock-up shall include the complete item or system with all associated items.

10.0 MEASUREMENT

Mode of measurement is generally specified in each Specification. Whenever mode of measurement is not specified, IS: 1200 shall be applicable.

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फ़र्श के परिष्करण के लिए मानक विनिर्देश

STANDARD SPECIFICATION FOR FLOOR FINISHING

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	GM (E)	Standards Bureau Chairman
					Approved by		
7	01.06.20	REVISED & ISSUED AS STANDARD SPECIFICATION	Anish Mahala	Samir Das	Rajanji Srivastava		Sunil Kumar Saxena
6	03.03.15	REVISED & ISSUED AS STANDARD SPECIFICATION	AM	SD	JKB	PKM (Addn GM)	S CHANDA
5	06.07.10	REVISED & ISSUED AS STANDARD SPECIFICATION	GB	JS	JKB	VK	N. DUARI
4	21.03.07	REVISED & ISSUED AS STANDARD SPECIFICATION	SD	JKB	ARVIND KUMAR		V. CHATURVEDI
3	12.03.99	REAFFIRMED AS STANDARD SPECIFICATION	SD	MLB	SCJ		AS
2	16.03.94	REVISED & ISSUED AS STANDARD SPECIFICATION	JS	JS	AKG		AS

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Abbreviations:

ASTM	:	American Society for Testing and Materials
BS	:	British Standards
IS	:	Indian Standards
PVC	:	Polyvinyl Chloride

Structural Standards Committee

Convener: Mr. Rajanji Srivastava

Members:
Mr. Anurag Sinha
Mr. VK Panwar
Mr. Samir Das
Mr. Amitabh Kishore
Mr. Gyasuddin
Mr. Charanjit Singh (Projects)
Mr. Ravindra Kumar (Construction)

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CONTENTS

1.0 GENERAL 4
2.0 CEMENT CONCRETE FLOORING 5
3.0 HEAVY DUTY CEMENT CONCRETE FLOORING 6
4.0 CEMENT PLASTER SKIRTING 6
5.0 CERAMIC & VITRIFIED TILE FLOORING 7
6.0 ACID OR ALKALI RESISTANT TILES 9
7.0 MARBLE STONE FINISH 10
8.0 KOTA STONE FINISH 12
9.0 GRANITE STONE FINISH 15
10.0 PVC FINISH 17
11.0 ABRASION RESISTANT EPOXY FLOOR COATING SYSTEM 18
12.0 ABRASION & IMPACT RESISTANT POLYURETHANE CONCRETE FLOOR COATING SYSTEM 20
13.0 CHEMICAL RESISTANT NOVOLAC EPOXY FLOOR COATING SYSTEM 23
14.0 CHEMICAL RESISTANT NOVOLAC EPOXY WALL COATING SYSTEM 26
15.0 MEASUREMENTS 28

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1.0 GENERAL

This specification covers technical specification of various kind of floor finishes/ floorings to be used in building works.

1.1 Standards

Reference shall be made to the following Indian Standards for any further information etc. not covered in this specification.

IS: 2571	Code of practice for laying in situ cement concrete flooring.
IS: 3461	Specification for PVC asbestos floor tiles.
IS: 3462	Specification for unbaked flexible PVC flooring.
IS: 4441	Code of practice for use of resin type chemical resistant mortars.
IS: 4443	Code of practice for use of resin type chemical resistant mortars.
IS: 4457	Acid and/or alkali Resistant tiles.
IS: 4631	Code of practice for laying of epoxy resin floor toppings.
IS: 5318	Code of practice for laying of flexible PVC sheet and tile flooring.
IS: 5491	Code of practice for laying of in-situ granolithic concrete floor topping.
IS: 13630 (Part-1 to 15)	Methods of Testing of ceramic tiles, methods of test, sampling and basis for acceptance
IS 13712	Specification for ceramic tiles; definition, classification characteristic and marking.
IS 15622	Pressed ceramic tile - specification

Note: Wherever, codes other than IS codes are mentioned, equivalent IS codes are also acceptable.

1.2 Base/ sub base for floor finishing

Floor finishing shall be provided over base/ sub base of cement concrete or reinforced cement concrete (RCC) floor slab. In case of ground floor, the floor slab i.e. base/ sub base for floor finish shall be as per standard no. 7-67-0011 or as specified or as mentioned in drawings. For other upper floors, the floor slabs shall be the base/ sub base for floor finish.

1.3 Slope/ levelling of floor finishing

1.3.1 Finished floor shall be in slope towards drainage out-lets. Slope shall be ranging from 1: 48 to 60 or as directed by Engineer-In-Charge in Verandahs, Courtyards, Kitchen, Bath and other wet areas. Slope in Indian type water closet areas shall be 1:30 or as directed by Engineer-In-Charge. Further, necessary drop in flooring in bath, WC, kitchen near floor traps ranging from 6mm to 10mm will also be provided to avoid spread of water.

1.3.2 Necessary margin to accommodate these slopes and drops shall preferably be made in base/ sub base or base course of finishing layer.

1.3.3 Excepting above and if not mentioned specifically otherwise, top of floor finish of all areas/ rooms/ spaces in any particular floor shall be same throughout. If further filling on base floor slab is required for this purpose, the filling shall be done with cement concrete (1 cement: 2

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coarse sand: 4 graded stone aggregate, 20mm nominal size which shall be carried out in accordance with workmanship mentioned in the specification of cement concrete flooring for base course of cement concrete flooring) or cement mortar (1 cement: 3 coarse sand) as directed by Engineer-In-Charge.

1.4 Skirting

Skirting shall be provided with floor finish. If not mentioned otherwise skirting shall be of same finish as that of the flooring.

2.0 CEMENT CONCRETE FLOORING

2.1 General

Cement concrete flooring shall consist of a base course of cement concrete (laid over sub base/ base concrete floor) and a finishing layer.

2.2 Base course

Base course shall be of 40mm thick cement concrete (1 cement: 2 coarse sand: 4 graded stone aggregate, 20mm nominal size).

2.3 Finishing layer

Finishing layer shall be a floating coat of neat cement, including cement slurry (@ 2 kg of cement for area of one square metre).

2.4 Workmanship

2.4.1 The surface of floor slab shall be roughened with steel wire brushes without disturbing the concrete, cleaned, and the laitance shall be removed. Immediately before laying the floor finish, the base shall be wetted and a coat of cement slurry @ 2 kg of cement spread over an area of one square metre so as to get a good bond between the floor slab and base course.

2.4.2 Floor finish of specified thickness shall be laid in the pattern including the border as given in the drawings or as directed by the Engineer-in-Charge. The border panels shall not exceed 450mm in width and the joints in the border shall be in line with panel joints. The panels shall be of uniform size and no dimension of a panel shall exceed 2 metre and the area of a panel shall not be more than 2 square metre. The joints of borders at corners shall be mitred for provision of strips.

2.4.3 Cement concrete floor finish shall be laid in one operation using glass/ aluminium/ PVC/ brass / stainless steel or any other strips (as specified or as per instructions of the Engineer-in-Charge) at the junction of two panels to ensure uniformity in colour of all the panels and straightness at the junction of the panels. The strips shall be fixed with their tops at proper level, giving required slopes.

If, type of strip is not specified anywhere, minimum 3mm thick PVC strips shall be provided.

2.4.4 Base course of cement concrete shall be placed in the panels and be levelled with the help of straight edge and trowel and beaten with thapy or mason's trowel. The blows shall be fairly heavy in the beginning but as consolidation takes place, light rapid strokes shall be given. Beating shall cease as soon as the surface is found covered with a thin layer of cream of mortar. The evenness of the surface shall be tested with straight edge. Surface of flooring shall be true to required slopes. While laying concrete, care shall be taken to see that the strips are not damaged/disturbed. The tops of strips shall be visible clearly after finishing with cement slurry.

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2.4.5 The finishing layer of the floor finish shall follow immediately after the cessation of beating. The surface shall be left for some time, till moisture disappears from it or surplus water can be mopped up. Use of dry cement or cement and sand mixture stiffening the concrete to absorb excessive moisture shall not be permitted. Excessive trowelling shall be avoided. Fresh cement shall be mixed with water to form thick slurry and spread @ 2 kg of cement over an area of 1 sqm of flooring while the flooring concrete is still green. The cement slurry shall then be properly processed and finished smooth.

2.4.6 The junctions of floor with wall plaster, dado or skirting shall be rounded off.

2.4.7 The curing shall be done for a minimum period of ten days. Curing shall not be commenced until the top layer has hardened. Covering with empty gunnies bag shall be avoided as the colour of the flooring is likely to be bleached due to the remnants of cement dust from the bags.

3.0 HEAVY DUTY CEMENT CONCRETE FLOORING

3.1 General

Heavy duty cement concrete flooring shall consist of a base course of cement concrete (laid over sub base/ base concrete floor) and a finishing layer.

3.2 Base Course

Base course shall be of 40mm thick cement concrete (1 cement: 2 coarse sand: 4 graded stone aggregate, 20mm nominal size).

3.3 Finishing layer

Finishing layer shall be of 12mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix: 2 graded stone aggregate 6mm nominal size) by volume laid over the base course.

Hardener/ hardening compound shall be mixed @ 2 litre per 50 kg of cement or as per Manufacturer's specifications.

3.4 Workmanship

3.4.1 Base course shall be laid in accordance with clause nos 2.4.1, 2.4.2, 2.4.3 & 2.4.4

3.4.2 The top surface of base course shall be roughened with brushes while the concrete is still green and the forms/strips shall be kept projecting up 12mm over the concrete surface, to receive finishing layer.

3.4.3 The topping shall be laid on base course within 2 to 4 hours of its laying, true to provide a uniform and even surface. It shall be firmly pressed into the bottom concrete so as to have good bond with it. After the initial set has started, the surface shall be finished smooth and true to slope with steel floats.

3.4.4 The junctions of floor with wall plaster, dado or skirting shall be rounded off.

3.4.4 The curing shall be done for a minimum period of ten days. Curing shall not be commenced until the top layer has hardened. Covering with empty gunnies bag shall be avoided as the colour of the flooring is likely to be bleached due to the remnants of cement dust from the bags.

4.0 CEMENT PLASTER SKIRTING

4.1 General

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Cement plaster skirting shall be provided in cases of all types of cement concrete floorings if not mentioned otherwise.

Cement plaster skirting shall be with cement mortar 1:3 (1 cement: 3 coarse sand) finished with floating coat/ slurry of neat cement. The cement to be applied in the form of slurry for smooth finishing shall be at the rate of 2 kg of cement per litre of water applied over an area of 1 sqm.

Average thickness of cement plaster skirting shall not be less than 18mm.

If not mentioned otherwise, height of the skirting shall be 125mm.

4.2 Workmanship

4.2.1 The surface on which the skirting is to be applied shall be prepared for laying skirting. The joints shall be raked out to a depth of at least 15mm in masonry walls. In case of concrete walls, the surfaces shall be roughened by hacking. The surface shall be cleaned thoroughly, washed with water and kept wet before skirting is commenced.

4.2.2 Skirting shall be laid immediately after the surface is prepared. It shall be laid along with the border or adjacent panels of floor. The joints in skirting shall be kept true and straight in continuation of the line of joints in borders or adjacent panels. The skirting shall be finished smooth with top truly horizontal and joints truly vertical except where otherwise indicated.

4.2.3 The finishing of surface shall be done simultaneously with the borders or the adjacent panels of floor. Where skirting is flush with plaster, a groove 10mm wide and upto 5mm deep shall be provided in plaster at the junction of skirting with plaster.

4.2.4 Curing shall be commenced on the next day of plastering when the plaster has hardened sufficiently and shall be continued for a minimum period of 7 days.

5.0 CERAMIC & VITRIFIED TILE FLOORING

5.1 Ceramic Tile

5.1.1 Ceramic Tiles shall conform to IS 15622 and shall be of 1st quality, flat, true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance.

5.1.2 Classification and Characteristics of pressed ceramic tiles shall be as per IS 13712.

5.1.3 The tiles shall be tested as per IS 13630.

5.1.4 The tiles shall conform to table10 of IS 15622 with water absorption 3 to 6% (Group BII).

5.1.5 The top surface of the tiles shall be glazed. Glaze shall be either glossy or matt as specified. The underside of the tiles shall not have glaze on more than 5% of the area in order that the tile may adhere properly to the base. The edges of the tiles shall be preferably free from glaze. However, any glaze if unavoidable, shall be permissible on only upto 50 per cent of the surface area of the edges.

5.1.6 The tiles shall be non-slip type for flooring application in wet areas and of colour and pattern as specified in drawings, Item descriptions, job specification, design basis or approved by Engineer-in-Charge.

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5.1.7 If not mentioned elsewhere i.e. drawings, Item descriptions, job specification, design basis etc. sizes of the tiles shall be:

Flooring : 300mm x 300mm
Dado : 300mm x 450mm
Thickness : As specified by the Manufacturer.

5.2 Vitrified Tiles

5.2.1 Specification of vitrified tiles shall be similar to 5.1 excepting following specifications which vitrified tiles shall conform.

5.2.2 The tiles shall conform to Table 12 of IS 15622 (Tiles with water absorption less than 0.08 per cent, Group BIa).

5.2.3 Sizes of the tiles shall be as per drawings/ Item descriptions/ job specification/ design basis etc. as directed by Engineer-In-Charge. Thickness shall be as specified by the Manufacturer.

5.2.4 If not mentioned elsewhere i.e. drawings, Item descriptions, job specification, design basis etc. 600mm x 600mm glazed tiles finished with digital printing shall be used.

5.3 Workmanship

The finished surface shall not sound hollow when tapped with a wooden mallet.

The tiles shall be laid in pattern as per drawing.

5.3.1 Base concrete or the RCC slab or plastered wall surface on which the tiles are to be laid shall be cleaned, wetted and mopped.

5.3.2 The tiles shall be laid over a coating of polymer modified, thin set, quick set tile adhesive conforming to IS 15477. The adhesive shall be thoroughly mixed with water and a paste of zero slump shall be prepared so that it can be used within 1.5 to 2 hours. It shall be spread over an area not more than one sqm at one time. Average thickness of adhesive shall be 3mm. The adhesive so spreaded shall be combed using suitable trowel. Tiles shall be pressed firmly in to the position with slight twisting action checking it simultaneously to ensure good contact gently being tapped with wooden mallet till it is properly backed with adjoining tiles. The tiles shall be fixed within 20 minutes of application of adhesive. The surplus adhesive from the joints, surface of the tiles shall be immediately cleaned.

5.3.3 The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

5.3.4 The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope. In bath, toilet W.C. kitchen and balcony/ verandah flooring, suitable tile drop or as shown in drawing will be given in addition to required slope to avoid spread of water. Further tile drop will also be provided near floor trap.

5.3.5 For vertical surfaces, the tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

5.3.6 If not mentioned specifically elsewhere such as design basis, item description, drawings, job specifications etc. the joints of tiles shall be cleaned off to a depth of 2-3mm and all dust, loose particles shall be removed and joints shall then be flush pointed with white cement added with pigment to match the colour of tiles.

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5.3.7 If mentioned specifically elsewhere such as design basis, item description, drawings, job specifications etc. tiles shall be laid with 3mm thick PVC spacers at joints. When the laid tiles have set, the spacers shall be removed and the joints shall be filled and finished with approved quality food grade, stain & chemical resistant coloured epoxy grout matching with the colour of tiles.

5.3.8 The tiled floor shall then be kept wet for 7 days. After curing, the tiled surfaces shall be washed and finished clean

6.0 ACID OR ALKALI RESISTANT TILES

6.1 The Acid or Alkali Resistant tiles shall be of vitreous ware and free from deleterious substances. The iron oxide content allowable in the raw material shall not exceed two percent. The tiles shall be vitrified at the temperature of 1100 deg C and above and shall be kept unglazed. The finished, tile, shall appear fine grained in texture, dense and homogenous. The tiles shall be sound, true to slope, flat and free from flows and manufacturing defects affecting their utility.

The tiles shall conform to IS 4457.

The tiles shall be tested for water absorption, compressive strength, acid resistance as per IS 4457. Sampling procedure for acceptance tests and criteria for conformity shall be as per IS 4457.

The tiles shall be 10mm thick (tolerance: + 2 percent). The depth of the grooves on the underside of the tile shall not exceed 3mm.

The tiles shall be of required colour.

6.2 Workmanship

The finished surface shall not sound hollow when tapped with a wooden mallet.

6.2.1 Base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped.

6.2.2 The bedding for the tile shall be with acid/alkali resistant cement mortar 1:4 (1acid/alkali resistant cement: 4 coarse sand).

6.2.3 The average thickness of the bedding shall be 10mm for flooring and 12mm for skirting/ Dado while the thickness under any portion of the tiles shall not be less than 10mm.

6.2.4 Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it.

6.2.5 Over this mortar bedding neat grey acid/alkali resistant cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square metre over an area up to one square metre.

6.2.6 Tiles shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

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6.2.7 For vertical surfaces, the tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

6.2.8 The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope.

6.2.9 Tiles which are fixed in the floor adjoining the wall shall enter not less than 10mm under the plaster, skirting or dado.

6.2.10 After tiles have been laid surplus cement slurry shall be cleaned off. The joints shall be cleaned off the cement slurry with wire/coir brush or trowel to a depth of 2mm to 3mm and all dust and loose mortar removed. Joints shall then be flush pointed with acid/alkali resistant cement added with pigment if required to match the colour of tiles.

6.2.11 The tiled floor shall then be kept wet for 7 days. After curing, the tiled surfaces shall be washed and finished clean.

7.0 MARBLE STONE FINISH

7.1 Marble Stone Slabs

The marble slabs shall be of specified size, thickness, type, grade and colour. The marble from which the slabs are made shall be of selected quality, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. The sample of marble stone slabs shall be got approved from the Engineer-in-Charge.

Marble stone shall be laid in desired pattern using stones of desired color.

If not mentioned elsewhere i.e. item description, drawings, job specifications etc. marble stone slab shall be second quality Makrana white.

This specification does not cover Marble stone wall cladding and veneering.

Dimensions:

Except for dimensions shown in drawing or cut sizes required to cover the balance areas along peripheries, dimensions of slabs shall be 600mm to 2500mm in length and 600mm to 1000mm in width as per drawing and as directed by Engineer-In-Charge.

Tolerance of + 3% shall be allowed for the thickness. In respect of length and breadth of slabs a tolerance of + 2% shall be allowed.

If not mentioned elsewhere i.e. i.e. item description, drawings, job specifications design basis etc. thickness shall be as below.

1. Thickness of stone slab in flooring and horizontal surfaces: 18mm.
2. Thickness of stone slab in skirting, dado and vertical surfaces: 12mm.

Marble stone in riser, tread of staircases, counter tops shall be of single piece upto 2000mm length. Nosing shall be provided in the treads &counter tops.

Physical properties:

Physical properties of Marble and method of testing shall be as follows:

Physical Property	Requirement	Method of test
Moisture absorption After 24 hours	Maximum 0.4%	IS: 1124

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Immersion in cold water		
Hardness	Minimum 3	Mhos scale
Specific Gravity	Minimum 2.5	IS: 1122

7.2 Workmanship

The slabs shall be washed clean before laying. Due care shall be taken to match the grains of slabs which shall be selected judiciously having uniform pattern of veins/ streaks or as directed by the Engineer-In-Charge.

The finished surface shall not sound hollow when tapped with a wooden mallet.

7.2.1 Laying

Laying on floor and horizontal surfaces:

Base slab on which the slabs are to be laid shall be cleaned, wetted and mopped.

Marble slabs shall be laid over average 22mm thick cement mortar 1:4 (1 cement : 4 coarse sand) bedding.

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar shall be allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already laid shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the marble slabs.

The slab to be laid shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible.

Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off.

Slabs which are fixed in the floor adjoining the wall shall enter not less than 12mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1mm.

Laying on vertical surfaces i.e skirting/ dado/ risers:

The joints shall be raked out to a depth of at least 15mm in masonry walls. In case of concrete surfaces, the surface shall be hacked and roughened with wire brushes. The base surface shall be cleaned thoroughly, washed with water and kept wet before laying is commenced.

In case of skirting, the wall surface shall be cut uniformly to the requisite depth so that the skirting face shall have the projection from the finished face of wall as shown in drawings or as required by the Engineer-in-Charge. In no case the skirting should project by more than thickness of stone.

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The slabs shall be held in position by suitable temporary measure such as wooden/ bamboo supports, temporary hook etc. as approved by Engineer-In- Charge. The line of the slab shall be at such a distance from the wall that the average width of the gap shall be 12mm and at no place the width shall be less than 10mm, The outer face of the slabs shall be checked for plane and plumb and corrected. The joints shall be as fine as possible and shall be filled with neat cement paste/ grout with white cement and pigment to match the colour of the slabs. The joints shall thus be left to harden and then the rear gap between the slabs and backing surface shall be packed with average 12mm thick cement mortar 1:3 (1 cement : 3 coarse sand). Temporary supports shall be removed after the mortar filling in the gap has acquired sufficient strength.

The joints shall be as fine as possible but not more than 1mm. The top line of the skirting/ dado/ risers shall be truly horizontal and joints truly vertical.

7.2.2 Curing, Polishing and Finishing

The surface shall be kept wet for a minimum period of 7 days. The day after the slabs are laid, all joints shall be cleaned of the grout with a wire brush or trowel. The surface shall thereafter be grounded evenly using the following carborundum stones.

1st grinding — coarse grade stone (No. 60)
Second grinding — medium grade (No. 80)
Final grinding — fine grade (No. 120)

If desired appearance of the finished surface is not achieved, the surface shall be further polished using requisite carborundum stones (including finer grade) as directed by Engineer-In-Charge.

Visible top surfaces of skirting/ dado etc. and edges of nosing shall be polished.

Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped.

Each grinding shall be done one day after the previous grinding has been done.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with a 'namdah' block (pad of woollen rags).

The following day after the last grinding/ polishing, the surface shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any stone is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

In case of pre-polished stones, any damage or unevenness on the surface shall be rectified.

8.0 KOTA STONE FINISH

8.1 Kota stone slabs

The Kota stone slabs shall be of specified size, thickness, selected quality and shade, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. These shall be machine cut to the requisite size and thickness and of the colour indicated in the drawings or as instructed by the Engineer-in-Charge. The sample of stone slabs shall be got approved from the Engineer-in-Charge. Kota stone shall be laid in desired pattern.

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The slabs shall have the top (exposed) face polished before being brought to site, unless otherwise specified.

All angles and edges of the slabs shall be true, square and free from chippings and the surface shall be true and plane.

Dimensions:

The slabs shall be machine cut to the requisite dimensions.

Except for dimensions shown in drawing or cut sizes required to cover the balance areas along peripheries, dimensions of slabs shall be 600mm to 2500mm in length and 600mm to 1000mm in width as per drawing and as directed by Engineer-In-Charge.

Tolerance of ±2mm shall be allowed for the thickness. In respect of length and breadth of slabs Tolerance of ± 2mm for machine cut slabs shall be allowed.

If not mentioned elsewhere i.e. item description, drawings, job specifications etc. thickness shall be as below.

1. Thickness of stone slab in flooring and horizontal surfaces: 25mm.
2. Thickness of stone slab in skirting, dado and vertical surfaces: 18mm.

Kota stone in riser, tread of staircases, counter tops shall be of single piece up to 2000mm length. Nosing shall be provided in the treads &counter tops.

8.2 Workmanship

The slabs shall be washed clean before laying.

The finished surface shall not sound hollow when tapped with a wooden mallet.

8.2.1 Laying

Laying on floor and horizontal surfaces:

Base slab on which the slabs are to be laid shall be cleaned, wetted and mopped.

Kota stone slabs shall be laid over average 15mm thick cement mortar 1:4 (1 cement: 4 coarse sand) bedding.

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar shall be allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already laid shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the marble slabs.

The slab to be plaid shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible.

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Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off.

Slabs which are fixed in the floor adjoining the wall shall enter not less than 12mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge.

The edges of the slabs to be jointed shall be buttered with grey cement, with admixture of pigment to match the shade of the slab. The thickness of the joints should be minimum as possible. In any location, it shall not exceed 1mm.

Laying on vertical surfaces i.e skirting/ dado/ risers and vertical surfaces:

The joints shall be raked out to a depth of at least 15mm in masonry walls. In case of concrete surfaces, the surface shall be hacked and roughened with wire brushes. The base surface shall be cleaned thoroughly, washed with water and kept wet before laying is commenced.

In case of skirting, the wall surface shall be cut uniformly to the requisite depth so that the skirting face shall have the projection from the finished face of wall as shown in drawings or as required by the Engineer-in-Charge. In no case the skirting should project by more than thickness of stone.

The slabs shall be held in position by suitable temporary measure such as wooden/ bamboo supports, temporary hook etc. as approved by Engineer-In- Charge. The line of the slab shall be at such a distance from the wall that the average width of the gap shall be 12mm and at no place the width shall be less than 10mm, The outer face of the slabs shall be checked for plane and plumb and corrected. The joints shall be as fine as possible and shall be filled with neat cement paste/ grout with white cement and pigment to match the colour of the slabs. The joints shall thus be left to harden and then the rear gap between the slabs and backing surface shall be packed with average 12mm thick cement mortar 1:3 (1 cement : 3 coarse sand). Temporary supports shall be removed after the mortar filling in the gap has acquired sufficient strength.

The edges of the slabs to be jointed shall be buttered with grey cement, with admixture of pigment to match the shade of the slab. The thickness of the joints should be as minimum as possible. In any location, it shall not exceed 1mm. The top line of the skirting/ dado/ risers shall be truly horizontal and joints truly vertical.

8.2.2 Curing, Polishing and Finishing

The surface shall be kept wet for a minimum period of 7 days. The day after the slabs are laid, all joints shall be cleaned of the grout with a wire brush or trowel. The surface shall thereafter be grounded evenly using the following carborundum stones.

First grinding — medium grade (No. 80)
Final grinding — fine grade (No. 120)

If desired appearance of the finished surface is not achieved, the surface shall be further polished using requisite carborundum stones (including finer grade) as directed by Engineer-In-Charge.

Visible top surfaces of skirting/ dado etc. and edges of nosing shall be polished.

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Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped.

Each grinding shall be done one day after the previous grinding has been done.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with a 'namdah' block (pad of woollen rags).

The following day after the last grinding/ polishing, the surface shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any stone is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

In case of pre-polished stones, any damage or unevenness on the surface shall be rectified.

9.0 GRANITE STONE FINISH

The Granite stone shall be of specified size, thickness, type, and colour (such as jet black, cherry red, elite brown, cat eye etc.). They shall be of selected quality, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes, machine cut and pre-polished/ of flamed finish. The sample of granite stone slabs shall be got approved from the Engineer-in-Charge.

Granite stone shall be laid in desired pattern using stones of desired color.

This specification does not cover Granite stone wall cladding and veneering.

Dimensions:

The slabs shall be machine cut to the requisite dimensions.

Except for dimensions shown in drawing or cut sizes required to cover the balance areas along peripheries, dimensions of slabs shall be 600mm to 2500mm in length and 600mm to 1000mm in width as per drawing and as directed by Engineer-In-Charge.

If not mentioned elsewhere i.e. item description, drawings, job specifications etc 18mm thick Granite slabs shall be provided.

Tolerance of + 1% shall be allowed for the thickness. In respect of length and breadth of slabs a tolerance of + 2% shall be allowed.

Granite stone in riser, tread of staircases, counter tops shall be of single piece upto 2000mm length. Nosing shall be provided in the treads &counter tops.

Finish:

If not mentioned elsewhere i.e item description, drawings, job specifications, design basis etc Granite stone shall be pre-polished finish.

Physical properties:

Physical properties of Granite and method of testing shall be as follows:

Physical Property	Requirement	Method of test
Moisture absorption After 24 hours	Maximum 0.5%	IS: 1124

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Immersion in cold water		
Specific Gravity	Minimum 2.6	IS: 1122

9.2 Workmanship

The slabs shall be washed clean before laying.

The finished surface shall not sound hollow when tapped with a wooden mallet.

9.2.1 Laying

Laying on floor and horizontal surfaces:

Base slab on which the slabs are to be laid shall be cleaned, wetted and mopped.

Granite slabs shall be laid over average 22mm thick cement mortar 1:4 (1 cement: 4 coarse sand) bedding.

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar shall be allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already laid shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the granite slabs.

The slab to be plaid shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible.

Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off.

Slabs which are fixed in the floor adjoining the wall shall enter not less than 12mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1mm.

Laying on vertical surfaces i.e skirting/ dado/ risers:

The joints shall be raked out to a depth of at least 15mm in masonry walls. In case of concrete surfaces, the surface shall be hacked and roughened with wire brushes. The base surface shall be cleaned thoroughly, washed with water and kept wet before laying is commenced.

In case of skirting, the wall surface shall be cut uniformly to the requisite depth so that the skirting face shall have the projection from the finished face of wall as shown in drawings or as required by the Engineer-in-Charge. In no case the skirting should project by more than thickness of stone.

The slabs shall be held in position by suitable temporary measure such as wooden/ bamboo supports, temporary hook etc. as approved by Engineer-In- Charge. The line of the slab shall be at such a distance from the wall that the average width of the gap shall be 12mm and at no place the width shall be less than 10mm, The outer face of the slabs shall be checked for plane

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and plumb and corrected. The joints shall be as fine as possible and shall be filled with neat cement paste/ grout with white cement and pigment to match the colour of the slabs. The joints shall thus be left to harden and then the rear gap between the slabs and backing surface shall be packed with average 12mm thick cement mortar 1:3 (1 cement : 3 coarse sand). Temporary supports shall be removed after the mortar filling in the gap has acquired sufficient strength.

The joints shall be as fine as possible but not more than 1mm The top line of the skirting/ dado/ risers shall be truly horizontal and joints truly vertical.

9.2.2 Curing, Polishing and Finishing

The surface shall be kept wet for a minimum period of 7 days. The day after the slabs are laid, all joints shall be cleaned of the grout with a wire brush or trowel. The surface shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any stone is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

Any damage unevenness of the stone surface shall be rectified.

10.0 PVC FINISH

10.1 PVC Roll/ Tiles

PVC roll/ tiles shall be homogenous, of approved texture, colour, pattern, with polyurethane surface protection and shall be of class-1 category for surface spread of flame when tested in accordance with BS 476, part-7.

PVC rolls shall conform to IS: 3462 and PVC tiles shall conform to IS: 3462.

Antistatic PVC roll/ tiles shall conform to B.S.2050, Table-2.

Thickness of PVC roll/ tiles shall be 2mm.

Size of tiles shall be 600mm x 600mm.

If not mentioned elsewhere i.e item description, drawings, job specifications, design basis etc. PVC floor finish shall be with PVC rolls.

PVC roll/ tiles shall be laid in desired pattern in accordance with drawing or as directed by Engineer-In-Charge.

10.2 Workmanship

The base floor on which PVC finish is to be laid shall be prepared in accordance with PVC tile/roll Manufacturer's recommendation.

The base floor shall be made permanently smooth, firm, free of cracks and dry. If required, suitable leveling compound as recommended and approved by PVC tile/roll manufacturer shall be applied over the base floor.

PVC rolls/tiles shall be brought to the temperature of the area in which it is to be laid and stacked suitably near the site in accordance with manufacturer's recommendation.

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Laying of PVC roll/ tile shall be in accordance with manufacturer's recommendation using adhesive (Fevicol SR-505 or other adhesive as recommended by Manufacturer and approved by Engineer-In-Charge).

In case of rolls, minimum possible number of joints shall be provided.

PVC rolls shall be placed in position from one end onwards slowly without creation on any air pockets between roll and the base floor.

PVC rolls/tiles shall be placed only when the adhesive is set sufficiently for laying. After placing, the rolls/tiles shall be pressed suitably with a wooden roller weighing about 5 kg. The joint between adjacent rolls shall be thin hairline type.

PVC rolls in flooring shall he continued for skirting without any joints.

Joints, seams of the PVC flooring shall be sealed by thermo-welding the joints using PVC welding bar of matching colour.

Any excess adhesive squeezing out of the surface shall he wiped off immediately with a wet cloth. In case of such excess adhesive becoming hard, it shall be removed using suitable removing product.

After a minimum period of 24 hours after laying the rolls/tiles, the finished floor shall be cleaned with a wet cloth soaked in warm soap or detergent solution as per approved manufacturer's specifications.

11.0 ABRASION RESISTANT EPOXY FLOOR COATING SYSTEM

Abrasion resistant epoxy floor coating system shall consist of primer coat, levelling/ self smoothening screed and a top finishing coat. All components of the system shall be compatible to it's under and top layer/coat and shall be of single Manufacturer.

11.1 Material

Primer, screed and top coat shall meet the requirements of the table below :

Requirement	Primer	Screed	Top Coat
Material	Solvent free Epoxy resin.	Shall comprise of resin base, resin hardener and fillers and shall be self-smoothening.	Shall comprise of resin base, resin hardener and aggregate/ fillers , shall be self-smoothening and of approved colour.
Dry film Thickness (Minimum)	200 micron	2000 micron	2000 micron
Material coverage	Material shall be applied in quantity worked out considering minimum coverage mentioned in the data sheet (authenticated by the Manufacturer) for intended surface area for specified thickness.		
Tensile strength (Minimum Value) Material shall meet minimum value corresponding to any test method mentioned below.			
ASTM D 638	-	08 MPa at 7 days	51Mpa at 7 days

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Page 1269 of 2811 : B895-TENDER_DOC-B895-999-81-46-CF-T-8202 : Rev. A

ASTM C 307	-	-	25 MPa at 7 days
EN ISO 527	-	-	07 MPa at 7 days
BS 6319 Part-7	-	08 MPa at 7 days	10 MPa at 7 days
Compressive strength (Minimum Value) Material shall meet minimum value corresponding to any test method mentioned below.			
ASTM D695	-	40 MPa at 7 days	50 MPa at 7 days
ASTM C 579	-	-	40 MPa at 7 days
EN ISO 604	-	-	50 MPa at 7 days
BS 6319 Part-2	-	50 MPa at 7 days	50 MPa at 7 days
Abrasion resistance (Minimum Value)			
ASTM D 4060	-	-	45 Mg thickness loss/ 1000 cycle of CS 17 wheel
Shore D Hardness (Minimum Value)			
ASTM D 2240	-	75	75
Bond strength to concrete (Minimum Value) Material shall meet minimum value corresponding to any test method mentioned below.			
ASTM D 4541	1.5 MPa concrete failure	-	-
ASTMD 412	1.0 MPa concrete failure	-	-

11.2 Workmanship

The work shall be carried out by Applicator recommended by coating Manufacturer and approved by Engineer-In-Charge.

Waiting time between the coats i.e. primer, screed and top coat should be as recommended by Manufacturer.

Surface preparation:

Base concrete slab shall be grinded thoroughly (minimum upto 150-200 microns) to make the surface suitable for epoxy application and achieve desired surface profile.

Base concrete slab on which epoxy coating is to applied shall be cleaned and made free from oil, grease, foreign particles,dust, dirt, debris, loose epoxy coatings, paint, sealers etc. by using wire brushes or mechanical means.

Cutting of construction & control joints in concrete floor including Isolation joints in perimeter of column, Door & floor joint, Machine foundation should be done within 48 to 72 hours after the concrete floor is laid.

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These joints in the concrete floor shall be filled with Poly-Urathane sealant (Having Shore A hardness more than 60 and Movement Accommodation Factor (MAF) more than 10%).

Any damage or pot holes in the concrete floor shall be rectified as directed by Engineer-In-Charge.

Primer coat:

Primer coat shall be applied when the prepared surface is ready for such application.

Primer coat as per specification shall be applied by brush and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

The primer will be left for minimum seven hours or as recommended by manufacturer. to dry before the application of screed.

Screed:

Screed as per specification shall be applied over the primed surface using steel trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment in the screed.

The screed shall be left to get air cured for minimum time as recommended by manufacturer so asto get the floor dry and hard to take care of walking movement. Further it will be cleaned and inspected for pin holes which shall be patched up suitably.

Top coat:

Top coat as per specification and of approved colour shall be applied over the screed using steel trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment.

Any damage or incorrect work/finish shall be suitably rectified.

The finished surface shall be left to dry and cure for minimum 24 hours (for human movement), 72 hours (for light weight movement), 7 days (for heavy movement) or as recommended by manufacturer.

11.3 Submittals by Contractor

Contractor shall submit following:

1. Product Data Sheet authenticated (signed and stamped) by the Manufacturer.
2. Test certificates in support of specified properties/ values.

12.0 ABRASION & IMPACT RESISTANT POLYURETHANE CONCRETE FLOOR COATING SYSTEM

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Abrasion & impact resistant Polyurethane (PU) concrete floor coating system shall consist of primer coat, screed or scratch-coat and a top finishing coat. All components of the system shall be compatible to it's under and top layer/coat and shall be of single Manufacturer.

12.1 Material

Primer, screed or scratchcoat and top coat shall meet the requirements of the table below :

Requirement	Primer	Screed or scratch-coat	Top Coat
Material	Waterborne Epoxy resin or other material compatible to other coats of the system.	Shall comprise of Polyurethane Resin base, resin hardener and fillers	Shall comprise of resin base, resin hardener and aggregate/ fillers , shall be self-smoothening, fast setting and of approved colour
Dry Film Thickness (Minimum)	50 micron	1000 micron	3000 micron
Material coverage	Material shall be applied in quantity worked out considering minimum coverage mentioned in the data sheet (authenticated by the Manufacturer) for intended surface area for specified thickness.		
Tensile strength (Minimum Value) Material shall meet minimum value corresponding to of any test method mentioned below.			
ASTM D 638	-	05 MPa at 28 days	05 MPa at 28 days
ASTM C 307	-	06 MPa at 28 days	06 MPa at 28 days
EN ISO R527	-	09 MPa at 28 days	09 MPa at 28 days
BS 6319 Part-7	-	06 MPa at 28 days	06 MPa at 28 days
Compressive strength (Minimum Value) Material shall meet minimum value corresponding to of any test method mentioned below.			
ASTM D695	-	40 MPa at 28 days	40 MPa at 28 days
ASTM C 579	-	40 MPa at 28 days	40 MPa at 28 days
BS 6319 Part-2	-	45 MPa at 28 days	45 MPa at 28 days
Abrasion resistance (Minimum Value)			
ASTM D 4060	-	-	50Mg thickness loss/ 1000 cycle of CS 17 wheel
Bond strength to concrete (minimum value) Material shall meet minimum value corresponding to of any test method mentioned below.			
ASTM D 4541	1.5 MPa concrete failure	-	-
ASTMD 412	1.0 MPa concrete	-	-

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	failure		
Impact Resistance (minimum Value)			
ASTM D 2794	-	-	8 Joules for 3mm thickness

12.2 Workmanship

The work shall be carried out by Applicator recommended by coating Manufacturer and approved by Engineer-In-Charge.

Waiting time between the coats i.e. primer, screed and top coat shall be as recommended by Manufacturer.

Surface preparation:

Base concrete slab shall be grinded thoroughly (minimum upto 150-200 microns) to make the surface suitable for epoxy application and achieve desired surface profile.

Base concrete slab on which PU coating is to applied shall be cleaned and made free from oil, grease, foreign particles,dust, dirt, debris, loose epoxy coatings, paint, sealers etc. by using wire brushes or mechanical means.

Cutting of construction & control joints in concrete floor including Isolation joints in perimeter of column, Door & floor joint, Machine foundation should be done within 48 to 72 hours after the concrete floor is laid.

These joints in the concrete floor shall be filled with Poly-Urethane sealant (Having Shore A hardness more than 60 and Movement Accommodation Factor (MAF) more than 10%).

Any damage or pot holes in the concrete floor shall be rectified as directed by Engineer-In-Charge.

Primer coat :

Primer coat shall be applied when the prepared surface is ready for such application.

Primer coat as per specification shall be applied by brush and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

The primer will be left for minimum seven hours or as recommended by manufacturer to dry before the application of screed.

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Screed or Scratch coat:

Screed or Scratch-coat shall be applied over the primed surface using notched trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment in the screed.

The screed shall be left to get air cured for 3-4 hours or as recommended by the Manufacturer to get the floor dry and hard to take care of walking movement. Further it will be cleaned and inspected for pin holes which shall be patched up suitably.

Top coat:

Top coat as per specification and of approved colour shall be applied over the screed or scratch coat using notched trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment.

Any damage or incorrect work/finish shall be suitably rectified.

The finished surface shall be left to dry and cure for minimum 24 hours (for human movement), 72 hours (for light weight movement), 7 days (for heavy movement) or as recommended by the Manufacturer.

12.3 Submittals by Contractor

Contractor shall submit following:

1. Product Data Sheet authenticated (signed and stamped) by the Manufacturer.
2. Test certificates in support of specified properties/ values.

13.0 CHEMICAL RESISTANT NOVOLAC EPOXY FLOOR COATING SYSTEM

Chemical resistant Novolac Epoxy floor coating system shall consist of primer coat, levelling screed or scratch coat and chemical resistant top coat. All components of the system shall be compatible to it's under and top layer/coat and shall be of single Manufacturer.

13.1 Material

Primer, screed or scratch coat, coloured coat and final clear coat shall meet the requirements of the table below:

Note:

For chemical resistant top coat, any option (option 1 and option 2) mentioned in the table is acceptable.

Requirement	Primer	Screed or scratch coat	Top coat	
			Option1 – Top coloured coat over clear chemical resistance coat	Option 2 – Coloured chemical Resistance coat

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Material	Solvent free Epoxy resin	Shall comprise of resin base, resin hardener and fillers and shall be self-smoothening	Top coloured coat shall comprise of resin base, resin hardener and aggregate/ fillers , shall be self-smoothening and of approved colour Clear chemical resistance coat shall comprise of resin, hardener and shall be self smoothening and shall be solvent free.	Shall comprise of resin, hardener and shall be self smoothening and shall be solvent free and of approved colour.
Dry Film Thickness (Minimum)	200 micron	2000 micron	Total 1000 micron (500 micron for both clear and coloured coat)	500 micron
Material coverage	Material shall be applied in quantity worked out considering minimum coverage mentioned in the data sheet (authenticated by the Manufacturer) for intended surface area for specified thickness.			
Tensile strength (Minimum Value) Material shall meet minimum value corresponding to of any test method mentioned below.				
ASTM D 638	-	08 MPa at 7 days	14 MPa at 7 days	14 MPa at 7 days
ASTM C 307	-	-	-	-
EN ISO 527	-	-	-	-
BS 6319 Part-7	-	08 MPa at 7 days	-	-
Compressive strength (Minimum Value) Material shall meet minimum value corresponding to of any test method mentioned below.				
ASTM D 695	-	40 MPa at 7 days	60 MPa at 28 days/	-
ASTM C 579	-	-	85 Mpa at 28 days	-
EN ISO 604	-	-	-	-
BS 6319 Part-2	-	50 MPa at 7 days	-	-

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Abrasion resistance				
ASTM D 4060	-	45 Mg thickness loss/ 1000 cycle of CS 17 wheel	-	60 Mg thickness loss/ 1000 cycle of CS 17 wheel
ASTM D 4060	-	-	-	<0.10 Mg/ cycle of 1 Kg CS10 wheel
Shore D Hardness				
ASTM D 2240	-	70	70	70
Bond strength to concrete Material shall meet minimum value corresponding to any test method mentioned below.				
ASTM D 4541	1.5 MPa Concrete failure	-	-	-
ASTMD 412	1.0 MPa concrete failure	-	-	-

13.2 Workmanship

The work shall be carried out by Applicator recommended by coating Manufacturer and approved by Engineer-In-Charge.

Waiting time between the coats i.e. primer, screed or scratch coat, top coloured coat and top clear coat shall as recommended by Manufacturer.

Surface preparation:

Base concrete slab shall be grinded thoroughly (minimum upto 150-200 microns) to make the surface suitable for epoxy application and achieve desired surface profile.

Base concrete slab on which epoxy coating is to applied shall be cleaned and made free from oil, grease, foreign particles, dust, dirt, debris, loose epoxy coatings, paint, sealers etc. by using wire brushes or mechanical means.

Cutting of construction & control joints in concrete floor including Isolation joints in perimeter of column, Door & floor joint, Machine foundation should be done within 48 to 72 hours after the concrete floor is laid.

These joints in the concrete floor shall be filled with Poly-Urathane sealant (Having Shore A hardness more than 60 and Movement Accommodation Factor (MAF) more than 10%).

Any damage or pot holes in the concrete floor shall be rectified as directed by Engineer-In-Charge.

Primer coat:

Primer coat shall be applied when the prepared surface is ready for such application.

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Primer coat as per specification shall be applied by brush and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

The primer will be left for minimum seven hours or as recommended by manufacturer. to dry before the application of screed.

Screed:

Screed as per specification shall be applied over the primed surface using steel trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment in the screed.

The screed shall be left to get air cured for 7 hours or as recommended by the Manufacturer to get the floor dry and hard to take care of walking movement. Further it will be cleaned and inspected for pin holes which shall be patched up suitably.

Top coat:

Top coat as per specification and of approved colour shall be applied over the screed using steel trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Chemical resistance top coat should be immediately applied to the prepared surface ensuring a continuous coating of uniform thickness. Stiff nylon brush or short nap roller is recommended for such application.

Chemical resistant, clear coating (option-1) shall be applied over cured top coloured coat using roller, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment.

Any damage or incorrect work/finish shall be suitably rectified.

The finished surface shall be left to dry and cure for minimum 24 hours (for human movement), 72 hours (for light weight movement), 7 days (for heavy movement) or as recommended by the Manufacturer.

13.3 Submittals by Contractor

Contractor shall submit following:

1. Product Data Sheet authenticated (signed and stamped) by the Manufacturer.
2. Test certificates in support of specified properties/ values.

14.0 CHEMICAL RESISTANT NOVOLAC EPOXY WALL COATING SYSTEM

Chemical resistant Novolac epoxy wall coating system shall consist of primer coat and a top coloured coat All components of the system shall be compatible to it's under and top layer/coat and shall be of single Manufacturer.

14.1 Material

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Primer and top coat shall meet the requirements of the table below :

Note :

For chemical resistant top coat, any option (option 1 and option 2) mentioned in the table is acceptable.

Requirement	Primer	Top coat	
		Option 1- Top coloured coat over chemical resistant clear coat	Option 2- Chemical Resistance coloured top coat
Material	Solvent free Epoxy resin	Chemical resistant clear coat shall comprise of resin, hardener and shall be self smoothening. Coloured coat shall comprise of resin base, resin hardener and shall be of approved colour	Shall comprise of resin, hardener and shall be self smoothening of approved colour.
Dry film Thickness (Minimum)	200 micron	Chemical resistant clear coat : 300 micron Coloured coat: 100 micron	400 micron
Material coverage	Material shall be applied in quantity worked out considering minimum coverage mentioned in the data sheet (authenticated by the Manufacturer) for intended surface area for specified thickness.		
Tensile strength (Minimum Value) Material shall meet minimum value corresponding to of any test method mentioned below.			
ASTM D 638	-	10 Mpa at 7 days	30 MPa at 7 days

14.2 Workmanship

The work shall be carried out by Applicator recommended by coating Manufacturer and approved by Engineer-In-Charge.

Waiting time between the coats i.e. primer, screed and top coat shall be as recommended by Manufacturer.

Surface preparation:

Base wall shall be grinded lightly or rubbed with a sand paper thoroughly to make the surface suitable for application and achieve desired surface profile.

Base on which coating is to applied shall be cleaned and made free from oil, grease, foreign particles, dust, dirt, debris, loose epoxy coatings, paint, sealers etc. using wire- brushes or mechanical means.

Putty may be applied to the base wall surface depending upon the exisiting condition of the surface and as directed by Engineer-In-Charge

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Any damage or holes or cracks in the wall shall be rectified as directed by Engineer-In-Charge.

Primer coat:

Primer coat shall be applied when the prepared surface is ready for such application.

Primer coat as per specification shall be applied by brush and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

The primer will be left for minimum seven hours or as recommended by manufacturer to dry before the application of screed.

Top coat:

Top coat as per specification and of approved colour shall be applied over the screed using steel trowel, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Chemical resistance top coat should be immediately applied to the prepared surface ensuring a continuous coating of uniform thickness. Stiff nylon brush or short nap roller is recommended for such application.

Chemical resistant, clear coating (option-1) shall be applied over cured top coloured coat using roller, mixing the ingredients in right proportion and in accordance with recommendations by the coating manufacturer to specified thickness and using specified coverage.

Spike Rollers shall be used to remove air entrapment.

Any damage or incorrect work/finish shall be suitably rectified.

14.3 Submittals by Contractor

Contractor shall submit following:

1. Product Data Sheet authenticated (signed and stamped) by the Manufacturer.
2. Test certificates in support of specified properties/ values.

15.0 MEASUREMENTS

For measurement of floor finishing, skirting, wall finishing etc. mentioned in this specification, actual finished surface shall be measured.

No deduction shall be done for cutting or wastage of materials.

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लकड़ी के काम का मानक विनिर्देश (दरवाजे एवं खिड़कियाँ)

STANDARD SPECIFICATION FOR WOODWORK (DOORS & WINDOWS)

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
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7	04.03.22	REVISED & ISSUED AS STANDARD SPECIFICATION	PIYALEE DAS	ATUL GUPTA	SAMIR DAS	SANJAY MAZUMDAR
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Abbreviations:

ASTM	: American Society for Testing and Materials
BS	: British Standards
CBRI	: Central Building Research Institute
EN	: European Standards
IS	: Indian Standard
ISO	: International Organization for Standardization
GI	: Galvanized Iron
NABL	: National Accreditation Board for Testing and Calibration Laboratories
NBC	: National building Code
NFPA	: National Fire Protection Association
PVC	: Polyvinyl Chloride
PUF	: Polyurethane foam
SS	: Stainless Steel
UL	: Underwriters Laboratories
CuM	: Cubic Meter

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CONTENTS

1.0 GENERAL 4
2.0 REFERENCES 4
3.0 DOORS, WINDOWS AND VENTILATORS 5
4.0 MATERIAL 5
5.0 DOOR, WINDOW AND VENTILATOR FRAMES (TIMBER) 7
6.0 DOOR SHUTTERS 8
9.0 MEASUREMENT 10

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1.0 GENERAL

This standard specification lays down the requirements of wood or wood based doors and windows.

2.0 REFERENCES

2.1 The codes and standards listed below contains provisions which through reference in this specification constitute provisions of this standard specification if not specifically mentioned otherwise.

2.2 In case of similar codes of different organizations such as IS, ISO, BS, EN, BS-EN, ASTM, NFPA, NBC etc. conformity with any of the similar codes is acceptable.

2.3 Reference codes and standards:

Sl.no:	Standards	Document Title
1.	IS 204 Part-1	Specification for Tower bolts, Part-1: Ferrous metals.
2.	IS 204 Part-2	Specification for Tower bolts, Part-2: Non- Ferrous metals.
3.	IS 205	Specification for non ferrous metal butt hinges
4.	IS 208	Specification for Door handles
5.	IS 287	Specification for Permissible moisture content for timber used for different purposes
6.	IS 303	Specification for plywood for general purposes.
7.	IS 401	Specification for preservation of timber.
8.	IS 710	Specification for marine plywood.
9.	IS 848	Specification for synthetic resin adhesives for plywood (phenolic and amino plastic)
10.	IS 851 (1978)	Specification for Synthetic Resin Adhesives For Construction Work (Non-Structural) in Wood
11.	IS 1003 Part-1	Specification for Timber paneled and glazed shutters, Part-1: Door shutters
12.	IS 1141	Specification for seasoning of timber.
13.	IS 1328	Specification for veenered decorative plywood.
14.	IS 1341	Specification for steel butt hinges.
15.	IS 1659	Specification for block board.
16.	IS 1708	Methods of testing of small clear specimens of timber
17.	IS 1734 (Part 1)	Specification for method of test for plywood.
18.	IS 2202 Part-1	Specifications for wooden flush door shutters (solid core type), Part 1: Plywood face panels.
19.	IS 2202 Part-2	Specification for wooden flush door shutters (solid core type), Part 2: Particle board and hardboard face panels
20.	IS 2209	Specification for mortise locks- (vertical type)
21.	IS 2338	Code of practice for finishing of wood and wood based materials. (Part I & II)
22.	IS 2835	Specification for flat transparent sheet glass.
23.	IS 3087	Specification for particle boards at wood & other lingno cellulosic material (medium density) for general purposes.
24.	IS 3097	Specification for veneered particle boards.
25.	IS 3564	Specification for hydraulically regulated door closers.
26.	IS 4021	Specification for timber door, window and ventilator frames.

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27.	IS 4835 (1979)	Specification Polyvinyl Acetate Dispersion Based Adhesives for Wood
28.	IS 5437	Specification for figured rolled and wired glass.
29.	IS 5509	Specification for fire retardant plywood.
30.	IS 6315	Specification for floor springs (hydraulically regulated) for heavy doors.
31.	IS 11215	Specification for determining moisture content of timber and timber products.
32.	IS 12823	Specification for plywood for prelaminated particle board.
33.	IS 12896	Specification for Indian timbers for door and window shutters and frames- Classification
34.	IS 14587	Specification for plywood for prelaminated medium density fibre board.

3.0 DOORS, WINDOWS AND VENTILATORS

3.1 Doors and windows shall be complete with frame, shutter/ leaves and hardware with all operational fittings and fixtures as mentioned in the drawings, job specification, item description etc.

3.2 Doors

3.2.1 Door frames shall be as mentioned in the drawings, job specification, item description etc.

If type of door frame is not specifically mentioned in the drawings, Job specs, item description etc, pressed steel door frame as specified in specification no 6-75-0004 shall be used..

Door shutters shall be Block board flush shutter, panelled door shutter, glazed wooden door shutter, flymesh door shutter as mentioned in the drawings, job specification, item description etc.

3.3 Windows

Window frames shall be as mentioned in the drawings, job specification, item description etc.

If type of window frame is not specifically mentioned in the drawings, Job specs, item description etc, powder coated aluminum frame as specified in specification no 6-75-0004 shall be used.

Window shutters shall be panelled/ glazed shutter, flymesh shutter as mentioned in the drawings, job specification, item description etc.

4.0 MATERIAL

4.1 Timber

4.1.1 Teakwood

Teakwood shall be second class Indian Teakwood conforming to IS 12896 of good quality, well seasoned, close grained and free from defects such as cracks, dead knots, sapwood etc. Individual hard and sound knot shall not be more than 40mm in diameter and aggregate area of all the knots shall not exceed one per cent of the piece.

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4.1.2 Deodar wood/ Sal wood

Hard wood shall be first class wood conforming to IS 12896 of good quality, well seasoned and free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 25mm in diameter and the aggregate area of all the knots shall not exceed 1% of the area of the piece.

4.1.3 Moisture content in timber

The maximum permissible percentage of moisture content for well seasoned timber shall be checked for every 1 cum or part thereof by electrical moisture meters as per IS: 287. Maximum permissible limit of moisture content of timber for different uses, shall be as per the procedure laid down in IS-11215, and as per table mentioned below:

No	Use	Max. Moisture content percent			
		Zone I	Zone II	Zone III	Zone IV
1.	Beams, Rafters & Posts	12	14	17	20
2.	Doors and windows a. 50 mm and above thickness b. Thinner than 50mm	10 8	12 10	14 12	16 14
3.	Flooring Strips	8	10	10	12
4.	Furniture and cabinet making	10	12	14	15

Tolerance on moisture content: Moisture content of individual samples shall be within +5 percent of maximum permissible moisture content as specified in Table above.

Seasoning of timber shall be done as per IS-1141 and preservative treatment of timber shall be as per IS 401.

4.1.4 Workmanship of wood work

Workmanship for wood and joinery shall be as per IS: 2338.

4.1.5 Painting/polishing of wood work

Painting/polishing of wood work shall be in accordance with specification No. 6-75-0007.

4.2 Plywood board

Plywood board shall be BWP grade or BWR grade as per IS 303.
Marine plywood shall confirm to IS 710.
Fire resistant plywood shall confirm to IS 5509.

Moisture content of the plywood boards when tested in accordance with IS 1734 (Part 1) shall not be less than 5 percent and not more than 15 percent. Testing shall be as per IS 303.

4.3 Particle Board

Particle board shall conform to IS 3087 and shall be flat pressed three layered or graded and of Grade 1, bonded with BWP type, Synthetic resin conforming to IS: 848. Testing shall be as per IS 3087.

4.4 Prelaminated Particle Board.

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Pre-laminated particle board shall conform to IS 12823 and shall be of Grade 1, bonded with BWP type Synthetic resin conforming to IS: 848. Testing shall be as per IS 12823.

4.5 Pre Laminated Medium density fibre Board

Pre-laminated medium density fibre board are available in two grades namely Grade I and II and shall conform to IS: 14587: 1998, laminated on both surfaces by synthetic resin conforming to IS: 848.

4.6 Block Board

Block board is a board having a core made up of strips of wood, not exceeding 30mm in width and shall conform to IS: 1659. Block board shall be of two grades: BWP grade, MR grade. The adhesives used for bonding shall be BWP type/ MR type Synthetic resin conforming to IS: 848.

4.7 Veneers

Veneers shall conform to IS 3097 (Veenered Particle board) and IS 1328 (Veenered decorative plywood).

4.8 Hardware

Reference shall be made to Clause 8.0

4.9 Glazing

Glass sheets for glazing shall be i) 4 mm thick plain glass (wt. 7.2 kg/m2) conforming IS:2835, or ii) 6.0 mm thick toughened glass conforming to IS:5437 as specified.

Glass sheets shall be free from flaws, scratches, cracks, bubbles etc.

If type of glass is not mentioned specifically, toughened glass shall be provided.

5.0 DOOR, WINDOW AND VENTILATOR FRAMES (TIMBER)

Timber for door, window and ventilator frames shall be as per IS 4021, and shall be in accordance with detailed drawings.

If not mentioned specifically, teakwood shall be used.

Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without any warp or bow. The wooden members of the frame shall have smooth, well planned surfaces except the surfaces touching the walls, lintels, sill etc. Rebates, rounding or moulding etc. shall be done before the members are jointed into frames.

Joints in the frame work shall be at right angles, pressed in position and shall be glued with adhesive confirming to IS 4835 or adhesive confirming to IS 851 and pinned with 10mm dia hard wood dowels or bamboo pins.

Wood work shall be painted/polished or otherwise treated as specified before fixing in position. All exposed portions shall be coated with wood primer and concealed surface by bituminous paints as per specification No. 6-75-0007.

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Before any surface treatment is applied, the wood work shall be got approved by the Engineer-in-charge. The frames shall be fixed to the masonry by 300mm x 25mm x 6mm MS hold fasts embedded in M-15 grade concrete size of 350mm x 100mm x 100mm in the hole of masonry. In case of concrete, frames shall be fixed by 12mm dia metallic anchor fasteners.

6.0 DOOR SHUTTERS

Door shutters shall be complete with all operational fittings & fixtures like hinges, overhead hydraulic door closers, Tower bolts, Locking device, handles, door stopper etc.

6.1 Block Board Flush Shutter

Block board flush shutter shall conform to IS: 2202. The shutter shall be minimum 35mm thick and shall be made of solid core block board. Width and height of the shutter shall be as shown in the drawings. The moisture content in timbers used in the manufacture of flush door shutters shall not be more than 12 percent when tested according to IS 1708.

Teak wood beading of minimum 12mm thickness fixed to the perimeter of the shutter. The shutter shall be faced on both sides with following finishes as specified and shall be factory made.

If not mentioned specifically, finishing shall be with lamination as described below.

A. 3mm thick commercial type plywood conforming to IS: 303, BS: 476 part-7 finished with two coats of approved quality and shade synthetic enamel paint over approved quality primer.

B. Approved quality 1mm thick teakwood veneering. Commercial face veneers shall conform to marine grade plywood and decorative face veneers shall conform to type I decorative plywood in IS 1328.

C. 1mm thick approved quality lamination of approved shade.

The edges of the shutters shall be painted/ varnished/ French polished as specified over a coat of primer as per specification No. 6-75-0007.

6.2 Panel Door Shutter

Panelled door shutters shall conform to IS 1003. Panel door shutters shall be minimum 35mm thick and shall consist of 100mm x 35mm teakwood stiles & top rail, 200mm x 35mm bottom rail and 150mm x 35mm lock rail and 12mm thick particle board infill panels. The infill panels shall be fixed with adhesive and moulded Teakwood beadings (minimum 12.5mm x 12.5mm size).

The shutter shall be painted with polyurethane paint or shall be varnished/ French polished as specified .

If not mentioned specifically, polyurethane paint shall be done.

6.3 Glazed Wooden Door Shutter

Glazed wooden door shutters shall confirm to IS 1003. Glazed wooden door shutter shall be minimum 38mm thick and shall consist of 100mm x 38mm Teakwood stiles and top rail, 200mm x 38mm bottom rail and 150mm x 38mm thick lock rail. 4mm thick plain glass or 6.0 mm thick toughened glass panels shall be fixed in the stiles & rails with neoperene adhesive and 12.5mm x 12.5mm moulded Teakwood beading. All the wood work shall be painted with

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polyurethane paint or shall be varnished/ French polished as specified.

If not mentioned specifically, toughened glass and polyurethane paint shall be provided.

6.4 Flymesh Door Shutter

Flymesh door shutter shall be minimum 38mm thick and shall consist of 100mm x 38mm Teakwood stiles and top rail, 200mm x 38mm bottom rail and 150mm x 38mm thick lock rail and net of SS/ galvanised MS wire gauge of IS gauge designation 856 & dia 0.56 mm fixed with moulded Teakwood beading. The shutter including wiremesh shall be painted with 2 coats of approved shade synthetic enamel paint or polyurethane paint or French polished.

If not mentioned specifically, SS net and polyurethane paint shall be provided.

7.0 WINDOW/ VENTILATOR SHUTTER/ PANEL

Window/ ventilator shutters / panels shall be glazed type with timber framing. Glass and timber shall be as specified.

If not mentioned specifically, teakwood and toughened glass shall be provided.

If flymesh shutter/ panels are specified, teakwood framing and SS nets (as specified for flymesh door shutter) shall be provided if not mentioned otherwise.

The timber framing shall be painted with synthetic enamel paint or polyurethane paint or shall be varnished/ French polished as specified .

If not mentioned specifically, polyurethane paint shall be done.

8.0 HARDWARE

8.1 Doors, windows and ventilators shall be provided with all required hardware for stability, proper operability. Hardware shall be fixed truly vertical or horizontal as the case may be.

8.2 Hardware used shall be well made, reasonably smooth, and free from all sharp edges and corners, flaws and other defects.

8.3 Hardware shall be of brass body (chromium plated) or powder coated Aluminum alloy or of Stainless Steel (SS-304) as mentioned in the drawings and as mentioned in the following table.

If not mentioned specifically, brass body (chromium plated) hardware shall be provided.

Sl. no:	Hardware	Specification
1	Hinges	Hinges shall be butt type conforming to IS. 205/ IS: 1341. Size of hinges shall be minimum 125mm long.
2	Overhead Hydraulic Door Closer:	Overhead hydraulic door closers shall be of heavy duty type and shall conform to IS: 3564.
3	Floor Mounted Door Closer	Floor mounted door closers shall be of heavy duty type and hydraulically operated and shall conform to IS: 6315
4	Mortice Lock	Mortice locks shall conform to IS: 2209.
5	Door Handles	Door handles shall conform to IS 208.
6	Aldrop	Aldrop shall be 300 mm long and minimum 18mm dia.

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7	Tower Bolt	Tower bolts shall conform to IS: 204.
8	Door Stopper	Door stoppers shall consist of heavy duty rubber shoes spring loaded type with zinc alloy pressure die cast chromium plated holders.
9	Toilet Door Latch	Toilet Door latch shall be with Vacant/occupied indicator.
10	Coat & Hat Hook	Coat & Hat hooks for Toilet doors shall be of chromium plated brass body or stainless steel.

8.4 Hardware of each shutter shall be as mentioned in drawing.

If not mentioned specifically, each door shutter shall be provided with hinges, tower bolts, overhead hydraulic door closer, door stopper, lock and door handles (on both side). Open type window/ ventilator shall be provided with handles, stays and tower bolts.

Lock and hydraulic door closer shall not be provided in toilet cubicles.

9.0 MEASUREMENT

9.1 Wood work in door/window frames shall be measured in Cu.M.
9.2 Door/window shutters shall be measured in Sq.M.
9.3 Hardware and fittings like locks, tower bolts, door closer etc. shall be counted in numbers provided.

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स्टील/अलुमिनियम दरवाजे, खिडकियों एवं रोशनदान का मानक विनिर्देशन

STANDARD SPECIFICATION FOR STEEL/ALUMINIUM DOORS, WINDOWS AND VENTILATORS

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Abbreviations:

ASTM	:	American Society for Testing & Materials
BS	:	British Standards
IS	:	Indian Standards
NBC	:	National Building Code of India
BIS	:	Bureau of Indian Standards
EN	:	European Standards
RCC	:	Reinforced Cement Concrete
VOC	:	Volatile Organic Compounds
ISO	:	International Organization for Standardization
NFPA	:	National Fire Protection Association

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CONTENTS

1.0 GENERAL 4
2.0 REFERENCES 4
3.0 DOOR,WINDOW AND VENTILATORS 5
4.0 STEEL DOORS 5
5.0 STEEL WINDOW & VENTILATORS 7
6.0 ALUMINIUM DOORS, WINDOWS AND VENTILATORS 9
7.0 STEEL, ALUMINIUM ROLLING SHUTTERS 11
8.0 MEASUREMENT 16

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1.0 GENERAL

This standard specification lays down the requirements of steel/ aluminium door, window and ventilator and rolling shutter assemblies for buildings.

2.0 REFERENCES

2.1 The codes and standards listed below contains provisions which through reference in this specification constitute provisions of this standard specification if not specifically mentioned otherwise.

2.2 In case of similar codes of different organizations such as IS, ISO, BS, EN, BS-EN, ASTM, NFPA, NBC etc. conformity with any of the similar codes is acceptable.

2.3 Reference codes and standards:

Sl.no:	Standards	Document Title
1.	IS 5	Colour for ready mixed paints and enamels.
2.	IS 325	Three phase induction motors
3.	IS 617	Specifications for aluminium and aluminium alloy ingots & castings for general engineering purposes.
4.	IS 733	Specifications for wrought aluminium and aluminium alloy bars, rods & sections for general engineering purposes.
5.	IS 737	Specifications for wrought aluminium and aluminium alloy sheet & strip for general engineering purposes.
6.	IS 1038	Specifications for steel doors, windows and ventilators.
7.	IS 1081	Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
8.	IS 1161	Steel Tubes For Structural Purposes - Specification
9.	IS: 1239	Steel tubes, tubulars and other wrought steel fittings — Specification
10.	IS 1285	Specifications for wrought aluminium and aluminium alloy extruded round tube & hollow sections for general engineering purposes.
11.	IS 1361	Specifications for steel windows for Industrial buildings.
12.	IS 1477 Part-2	Code of practice for painting of ferrous metals in buildings
13.	IS 1948	Specifications for Aluminium doors, windows and ventilators.
14.	IS 2062	Standard for hot rolled medium and high tensile structural steel
15.	IS 2074	Specifications for Ready mixed paint, air drying, red oxide zinc chrome, priming specification
16.	IS 2223	Dimensions of flange-mounted AC Induction motors
17.	IS 2253	Designation for types of construction and mounting arrangements of rotating electrical machines
18.	IS 2385	Designation for types of construction and mounting arrangements of rotating electrical machines
19.	IS 2553 Part-1	Safety glass – specification Part 1: General purposes
20.	IS 2835	Flat transparent sheet glass
21.	IS - 2968	Dimensions of slide rails for electrical motors
22.	IS 3548	Code of practice for glazing building

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23.	IS 3564	Specification for hydraulically regulated door closer
24.	IS 3614 Part-1	Specification for fire check doors. Part-1: Plate metal cover and rolling type
25.	IS 3614 Part-2	Specification for metallic and non metallic fire check doors. Part-2: Resistance test & performance criteria
26.	IS 4029	Guide for testing of three phase induction motors
27.	IS 4351	Specifications for steel door frames.
28.	IS 4454-part I	Steel wire for mechanical springs — specification
29.	IS 4691	Degree of protection provided by enclosure for rotating electrical machinery
30.	IS 4722	Rotating electrical machines
31.	IS 4889	Method of determination of efficiency of rotating electrical machines
32.	IS 5437	Figured rolled and wired glass
33.	IS 6248	Specifications for metal rolling shutters and rolling grill
34.	IS 6315	Specification for Floor springs (hydraulically regulated) for heavy doors.
35.	IS 6362	Designation of methods of cooling of rotating electrical machines
36.	IS: 7088	Recommended practice for anodizing aluminum and its alloys.
37.	IS 7452	Specification for hot rolled steel sections for doors, windows and ventilators.
38.	IS 12436 (1998)	Specifications for preformed rigid polyurethane (PUR) and polyisocyanurate (PIR) foams for thermal insulation..

3.0 DOOR,WINDOW AND VENTILATORS

3.1 Door, window and ventilator assemblies shall be complete with frames, shutters and required, hardware ensuring stability, safety and smooth operation.

3.2 Type of Door, window and ventilator assemblies shall be as mentioned in job specifications or construction drawings.

4.0 STEEL DOORS

4.1 Steel door assemblies shall have following components. For further details reference shall be made to EIL Standard Nos.7-75-0070, 7-75-0071 and 7-75-0074

Component	Specification
Door frame	Made of 16 SWG galvanized steel pressed and profiled to required size with 3mm thick MS flat spacers welded towards jamb size, 3mm thick MS pad plate and 18 SWG galvanized steel mortar guard welded at all hinge & lock locations. The vertical members shall be provided with 20mm x 20mm x 3mm welded MS angle threshold which shall be embedded in flooring. The hollow frame shall be filled up with concrete or any other approved suitable material.

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	Continuous "D" profile EPDM gasket shall be provided in the rebate of the frame in case of air-tight doors.
Door Shutter	Made of 18 SWG galvanized steel pressed and profiled to required size and thickness (minimum thickness – 40mm) with 3mm thick MS flat welded continuously along the perimeter of the shutter, profiled vertical stiffeners made of 18 SWG galvanized steel. The shutter shall be filled up with mineral wool (density – 48 Kg/ cum). Other approved filler material is permissible for large doors/shutters. In case of double shutters, suitable profiling/ rebating shall be done at the junction of meeting shutters for proper closure of the shutters.
Vision Panel	Vision panels shall be provided in the shutters as per project drawings. Glass shall be as mentioned in the drawings. Glass pane shall be fixed by means of 18 SWG galvanized steel "Z" angle welded to the shutter along the periphery of the opening and continuous EPDM gasket. If nothing is specified 350mm x 450mm sized vision panel with 5mm thick toughened glass shall be provided.
Louvers	Louvers shall be provided in the shutters if specified or mentioned in the project drawings. Louvers shall be made of 18 SWG galvanized steel "Z" profiled blades welded to the shutter. Louvers shall not be provided in air conditioned and pressurized area.

4.2 Hardware

Following hardware shall be provided in the steel door assemblies

Hardware	Specification
Hydraulic door closer	1 no. heavy duty hydraulic door closer confirming to IS 3564 for each shutter .
Tower/ Flush bolt	1 no. 10mm dia stainless steel Tower/ Flush Bolt (SS 304 grade, 250mm long upto 2100mm high door and 600mm long upto 2500 mm high door) for each shutter on both sides. For large size door (width- above 2000mm to 3000mm, height- above 2500mm to 3000mm), tower/ flush bolt shall be upto 1400mm long and shall be surface mounted or concealed type.
Aldrop	1 no. 16mm dia stainless steel Aldrop (SS 304 grade, 300mm long) for each shutter on both sides. For large size door (width- above 2000mm to 3000mm, height- above 2500mm to 3000mm), Aldrop shall be 400mm long.
Door Handle	1 no. 18mm dia stainless steel door handle (SS 304 grade, 200mm long) for each shutter on both sides. For large size door (width- above 2000mm to 3000mm, height- above 2500mm to 3000mm), door handles shall be 300mm long.
Door Stopper	1 no. spring loaded heavy duty door stopper for each shutter.
Hinges for shutters	100mm long stainless (SS 304 grade) steel heavy duty ball bearing hinge. Number of hinges shall be : 3 (for upto 2100mm high door)

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	4 (for upto 2400mm high door) 5 (for upto 2700mm high door) 6 (for upto 3000mm high door)

4.3 Fabrication & Installation

4.3.1 Doors shall be true to the plumb, size and design and smooth operation shall be ensured.

4.3.2 All metallic components shall be shall be welded or rigidly fixed together by mechanical means. Joints between horizontal and vertical frame members shall be mitred. All welding shall be finished smooth.

4.3.3 The frames shall be fixed to the masonry by means of 200 mm x 25 mm x 6 mm MS hold fast welded to the spacers and grouted with M-20 grade concrete in minimum 250 mm x 100 mm x 100 mm sized hole in the masonry.

4.3.4 In case of concrete, the frames shall be fixed by minimum 100 mm long, 12 mm dia metallic counter sunk type anchor fasteners through the frame and spacers.

4.3.5 Vertical frame member shall be tied together below floor finish by mean of 20mmx20mmx3mm MS Angle welded to both faces of frame.

4.3.6 40mmx150mmx3mm thick MS pad shall be welded to frame at all hinges and lock locations. 18 SWG GI mortar guard shall be provided at the back of hinges and lock.

4.3.7 The metallic surfaces shall be thoroughly cleaned of rust, mill scale, dirt, oil etc. and then finished with painting or powder coating as specified. If not specifically mentioned elsewhere, Finishing of the door assemblies shall be minimum 40 micron powder coating in desired colour. The thickness of powder coating shall be subjected to verification at site (on random basis) as directed by Engineer- in- Charge with appropriate measuring instruments supplied by contractor.

5.0 STEEL WINDOW & VENTILATORS

5.1 Steel window and ventilator assemblies shall have steel frames and shutters (glazed/with wire mesh/ with louvers as specified) with required hardware. For further details reference shall be made to EIL Standard Nos.7-75-0025, 7-75-0027 to 7-75-0032.

5.2 Steel windows and ventilators shall in general conform to IS 1038 and IS 1361.

5.3 Materials/ Assembly components

5.3.1 Frame and shutter shall be made of rolled steel sections conforming to IS: 7452.

5.3.2 Glass for glazed shutters shall be as specified. If nothing is mentioned specifically, minimum 5 mm thick toughened glass shall be provided.

5.3.3 Louvers shall be made of 18 SWG MS steel profiled sheets.

5.3.4 Wire mesh shall be of stainless steel (SS-304 grade) or wire of galvanized steel as specified. If nothing is mentioned specifically, stainless steel wire mesh shall be provided.

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5.4 Hardware

5.4.1 All hardware required for smooth operation, durability and safety such as handles, Peg-stays, hinges, closure of shutters etc. shall be provided.

5.5 Fabrication & Installation

5.5.1 Steel window and ventilator assemblies shall be true to the plumb, size and design and smooth operation shall be ensured.

5.5.2 All metallic components shall be shall be welded together. Joints between horizontal and vertical frame members shall be mitred. All welding shall be finished smooth.

5.5.3 Frames shall be fixed in the opening by means of 100mm x 15mm x 6 mm thick MS lugs @ grouted with M-20 grade concrete or with minimum 100 mm long, 12 mm dia metallic counter sunk type anchor fasteners. when fixing to steel work, mastic shall be applied to the sill of the opening and the unit shall be placed on it with the jambs and head buttered with mastic and the unit shall be fixed with special fixing dips or with nuts and bolts.

5.5.4 Where larger units are to be formed by coupling individual units, the mullions, transoms shall be bedded in mastic to ensure weather tightness. Mastic shall be applied liberally to the channels of the outside frame sections before assembly, and the two units being coupled shall be drawn together tight with clamps, the mastic being squeezed out and cut off neatly when the units shall be screwed together tight.

5.5.5 Where fixed glazing units are placed over openable units, a push fit weather bar shall be provided.

5.5.6 Before glazing, all opening parts shall be checked for their operational smoothness. The frame shall be completely cleaned and bedding putty shall be placed in the rebate before glazing. Glass then shall be cushioned into the bedding and shall be fronted with front putty in a manner so as to enable the painting to be done up to the sight line. The back putty oozing out over the glazing rebate shall be cut off square and smoothed down.

5.5.7 For panels exceeding 600 x 300 mm in size, glass shall be secured by special glazing clips inserted in holes already provided in the steel sections, before applying the front putty.

5.5.8 For glazing of very large areas, rust proof steel beading with mitred corners shall be provided with screws @ 10 cm. from each corner and @ 20 cm. apart from each other. Putty shall be provided to the face of the bead in contact with glass, in addition to back putty.

5.5.9 Side hung shutters shall be connected to the frame by means of friction hinges. The handle for side hung shutters shall be of pressed brass mounted on a steel handle plate welded to the opening shutter frame and shall not be removable easily after glazing. The handle shall have a two point nose which shall engage with a brass striking plate on the fixed frame in a slightly open as well as in a fixed position.

5.5.10 Top hung shutters shall be provided with steel butt hinges welded to the fixed frame after cutting a slot in it. Top hung casements shall be provided with peg stay of 3 holes of pressed brass; 300 mm long which when closed shall be held tightly by the locking bracket fitted to the fixed frame or to the window.

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5.5.11 All the steel surfaces shall be thoroughly cleaned free of rust, mill scale, dirt, oil etc. by sand and shot blasting and then finished with painting by priming with red oxide zinc chromate primer conforming to IS:2074 and minimum two coats of synthetic enamel paint conforming to IS:1477 (Part II). Putty shall also be provided with painting in a manner so as to seal the putty glass junction. Surfaces not meant for painting shall be cleaned of any strains of paint.

6.0 ALUMINIUM DOORS, WINDOWS AND VENTILATORS

6.1 Aluminium door, window and ventilator assemblies (glazed/with wire mesh/ with louvers as specified) shall have frames and shutters made of extruded profiled tubular Aluminium sections with required hardware. Aluminium window shutters shall be side hung or sliding type as mentioned in the design basis, job specifications or construction drawings. For further details reference shall be made to EIL Standard Nos. 7-75-0014, 7-75-0015, 7-75-0016, 7-75-0017 etc.

6.2 Materials/ Assembly components

6.2.1 Aluminium sections shall be extruded profiled tubular sections of approved Manufacturers having aluminium alloy as per IS: 733 and IS: 1285.

6.2.2 Aluminium sections shall be anodised as per IS: 7088 or electrostatically powder coated to as specified. The thickness of anodizing/ powder coating shall be subjected to verification at site (on random basis) as directed by Engineer- in- Charge with appropriate measuring instruments supplied by contractor.

6.2.3 If not mentioned specifically, the finishing of Aluminium sections shall be of powder coating in approved colour.

6.2.4 Thickness of powder coating shall be as specified. If not specified the minimum thickness shall be 50 micron.

6.2.5 Glass used for glazing shall be as specified. If not mentioned specifically minimum 5 mm thick toughened glass conforming to IS: 2835 shall be provided.

6.2.6 Louvers shall be made of 2 mm thick bend and profiled Aluminium sheets framed suitably and shall be fixed to the door/ window/ ventilator frame. The profiles and spacing of louver blades/ sheets shall ensure prevention of water ingress.

6.2.7 Wire mesh shall be of stainless steel (SS-304 grade) or wire of galvanized steel as specified. If nothing is mentioned specifically, stainless steel wire mesh shall be provided.

6.3 Hardware

6.3.1 If not specifically mentioned, following hardware shall be provided in the Aluminium door assemblies.

Hardware	Specification
Hydraulic door closer	1 no. heavy duty hydraulic door closer confirming to IS 3564 for each shutter .
Tower/ Flush bolt	1 no. 10mm dia aluminium or stainless steel (SS-304 grade), 250mm long upto 2100mm high door and 600mm long upto 2500 mm high door) for each shutter on both sides.

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	For large size door (width- above 2000mm to 3000mm, height- above 2500mm to 3000mm), tower/ flush bolt shall be upto 1400mm long and shall be surface mounted or concealed type. Finishing of Aluminium tower/ flush bolts shall be similar to aluminum profiled sections of the door assembly.
Door Handle	1 no. 10mm dia aluminium or stainless steel (SS-304 grade), minimum 250mm long for each shutter on both sides. For large doors, longer door handles shall be provided as mentioned in design basis, job specification or construction drawings. Finishing of Aluminium handles shall be similar to aluminum profiled sections of the door assembly.
Door Stopper	1 no. spring loaded heavy duty door stopper for each shutter.
Double action hydraulic floor spring	1 no for each shutter conforming to IS 6315 with double spring mechanism and pivot.
Lock	Brass body, minimum 4 lever

Note: In case of Aluminum doors, either Double action hydraulic floor spring as per IS 6315 or Hydraulic door closer as per IS 3564 will be applicable.

6.3.2 If not mentioned elsewhere, window/ ventilator assemblies shall be provided with hardware such as hinges, handles, peg-stays, tower/flush bolts, sliding mechanism etc. as required for safety, operation and durability.

6.3.3 If not mentioned elsewhere, visible hardware shall be of Aluminium having finishing similar to aluminum profiled sections of the window/ ventilator assembly.

6.4 Fabrication & Installation

6.4.1 Frames and shutters shall be square and flat, the corner of the frame being fabricated to true right angles. Aluminium sections of frames, shutters etc. shall be mitred and jointed rigidly.Details of construction of frames, shutters etc. shall be as per construction drawings and EIL standards.

6.4.2 In case of composite Door/window/ventilator units, the units shall be coupled as per drawing. Weather bar shall be provided whenever a coupling member is fitted over an external opening shutter.

6.4.3 The Aluminium frames shall be fixed in the openings by means of aluminium lugs fixed to the frame (by counter sunk brass machine screws) and grouted with concrete or by means of anchor fasteners.

6.4.4 Glazing shall be fixed to the extruded sections by means of extruded Aluminium beading. Glass panes shall be provided with EPDM gasket/rubber lining before fixing.

6.4.5 Side hung window shutters shall be fixed to the frame with pivots or hinges.

6.4.6 Gaps at the junction of opening and frame shall be filled up with weather silicon sealant.

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7.0 STEEL, ALUMINIUM ROLLING SHUTTERS

7.1 Rolling shutters shall be of steel or Aluminium as specified and shall conform to IS 6248.

7.2 Rolling shutters shall be push or pull type or operated by mechanical means or by electrical motors as specified. However, rolling shutter beyond 10 square metre in area shall not be push and pull type. If nothing is mentioned specifically, rolling shutters shall be electrical motor operated type.

7.4 Steel Rolling Shutters

7.4.1 Rolling shutter components

Components of steel rolling shutters shall have following specification.

1. Shutter

Shutter shall be built-up of inter locking lath section formed from cold rolled steel strips.

The thickness of the steel strips shall not be less than 0.90 mm for shutters upto 3.5 m width.

The lath sections shall have interlocking curls at both the edges and deep corrugation at the centre with a bridge depth of minimum 12 mm.

Each lath section shall be a continuous single piece without any welded joint.

When interlocked, the lath sections shall have a distance of 75mm rolling centers.

Each alternate lath sections shall be fitted with MS clips securely riveted at either ends to prevent lateral movement of the individual lath sections.

2. Guide channels

Guide channels shall be of mild steel . Width shall be minimum 25mm. Minimum depth (shutter clear width wise) shall be as below :

Upto 3.5 metre wide shutter – 65mm
3.5 metre to 8 metres – 75mm
8 metre and above – 100mm

The gap between the two legs of the guide channels shall be sufficient to allow free movement of the shutter and at tthe same time close enough to prevent rattling of the shutter.

3. Roller and brackets

The suspension shaft of the roller shall be heavy duty steel pipe conforming to IS 1161.

For shutter upto 6 metre width and height not exceeding 5 mitre, steel pipe of minimum 50 mm nominal bore shall be used.The shaft shall be supported on MS brackets.

Size of the brackets shall be minimum 375mm x 375mm x 3.15 for shutters upto clear height of 3.5 metre, minimum 500mm x 500mm x 10mm for clear height above 3.5 metre and upto 6.5 metre.

The suspension shaft shall be fitted with rotatable cast iron pulleys to which the shutter is attached. The pulleys and the pipe shaft shall be connected by means of pretensioned helical

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springs to counter balance the weight of the shutter and to keep the shutter in equilibrium in any partly open position.

When the width of the opening is greater than 3.5 metre, the pullies shall be interconnected with a cage formed out of MS flats and dummy rings to distribute the torque uniformly. Self aligning two row ball bearing with cast iron casing shall be provided at the extreme pully.

4. Spring

The spring shall be built of coiled type manufactured from high tensile spring steel wire or strips of adequate strength conforming to IS 4454-part I

5. Cover

Top cover shall be of mild steel sheets not less than 0.90mm thick and shall be stiffened with MS angle or flat stiffeners.

6. Hardware

Lock plates with sliding bolts, handles and anchoring rods conforming to IS 6248 shall be provided.

7. Grills

If specifically mentioned, rolling grills shall be provided in the shutter. In general, height of grill portion shall not exceed 500mm. In case of grills at multiple locations, cumulative height of the grill portions shall not exceed 1000mm. Grills shall be made of 8 mm dia MS round bars.

8. Finishing

All metallic parts shall be painted with minimum 2 coats of red oxide zinc chromate primer conforming to IS 2075. Visible parts shall be further painted with minimum two coats of synthetic enamel paint conforming to IS 2933.

7.4.2 Sizes and dimensions of various components mentioned in above clause are for normal conditions. For larger sizes and windy locations, the sizes and dimensions shall be suitably modified as directed by the Engineer-In-Chief.

7.4.3 Mechanically operated rolling shutters shall have suitable gear mechanism for smooth operation.

7.4.4 Motor operated rolling shutters shall be provided with necessary and suitable electrical fittings like motors, switch panel, switches, wires, cables etc. all complete and conforming to India standards.

7.4.5 Installation

Rolling shutters shall be installed true to the plane and fixed in the opening ensuring smooth operation as per IS 6248.

7.5 ALUMINIUM ROLLING SHUTTER

7.5.1 Aluminium Rolling Shutters shall be motorized gear operated and either double walled Insulated type or non- insulated type as specified complete with all accessories.

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The Brackets and hood cover shall conform to IS: 6248. The clear opening dimensions shall not exceed 5000 mm x 5000 mm.
The motorised rolling shutters shall be suitable for electrical motor operation (automatic) as well as manual operation with chain-wheel & hand chain. The rolling shutters shall be provided with mechanical reduction / bevel gear box for operation either mechanically or with electrical device.

7.5.2 Rolling shutter components

Components of Aluminium rolling shutters shall have following specification.

1. Shutter curtain

The shutter curtain shall be fabricated using aluminium alloy profiled slats. Aluminium alloy shall have composition of Magnesium 0.4-0.9 %, Silicon 0.3-0.7 %, Manganese 0.3% (maximum) and remaining Aluminium. Aluminium Alloy shall have UTS (Ultimate tensile strength) – 19 Kg/mm2 and Elongation – Min 7%.

The surface of these aluminium alloy shall be micro ribbed with the ends of alternate profiles fitted with end locks to prevent lateral movements of the laths.

The shutter curtains shall have interlocking aluminium alloy slats with integral bottom lock plate.

The non-insulated shutter curtains shall generally be of 80mm x18mm (minimum size) double-walled /skinned slats and the insulated shutter curtains shall be 80mm x 18mm double-walled / skinned slats (minimum size) with thermal PUF (Polyurethane Foam) insulation packing (within the walls).

The PUF packing shall be tight enough so as to fill all irregular voids and at joints. The PUF shall be non-toxic and fire retardant / self-extinguishing. The PUF density shall not be less than 40 kg / cu. meter and its thermal properties & characteristics shall be in accordance with IS-12436

2. Bracket

The bracket shall be made of mild steel conforming to relevant IS having minimum size of 350 mm x 350 mm x 3 mm thick for clear opening dimensions up to 4000 mm x 4000 mm & 350 mm x 350 mm x 4 mm thick for clear opening dimensions beyond 4000 mm x 4000 mm and up to 5000 mm x 5000 mm.

3. Shaft

MS Pipes used for the suspension shaft of the roller shall be heavy duty pipe suitable for mechanical purposes and shall conform to IS: 1239. Minimum diameter shall be 100mm.

4. Side Guides/ Channels

The side guides/ channels shall be joint less (single piece construction) made of aluminium alloy of minimum 3mm thickness. The guide rails shall be provided with PVC / Rubber / Brush seals to ensure silent shutter travel & effective sealing. Size shall be 105mm x 42mm or as required.

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5. Bottom Profile

Aluminium Bottom bar / locking plate shall be minimum 100mm high having a special non-degradable neoprene / rubber profile for providing a complete sealing upon closure.

6. Hood & Side-Motor Cover

The covers shall be made of painted GI sheets not less than 0.8 mm thick. They shall be of rectangular or cylindrical contour depending on the contour of the bracket / end plate. The hood cover shall be stiffened with angle or flat stiffeners at top and bottom edges to retain shape. The hood cover shall be fixed to the bracket plate by means of angle cleats and supported at the top at suitable intervals for preventing sagging. The hood & motor/actuator assembly - covering shall be a water-tight arrangement for ensuring no water seeps through to the internal mechanical & electrical components. Adequate slopes & guide-ways are to be provided to avoid any water accumulation on the hood-covers.

7.5.3 Finishing

All components of rolling shutter except springs and inside of guide channel shall be thoroughly cleaned with a mild non-corrosive chemical to free the substrate of rust, mill-scale, dirt, oil, etc.

Aluminium sections and other visible metallic surfaces shall be electrostatically powder coated (approved colour) to minimum 50 microns. The thickness of powder coating shall be subjected to verification at site (on random basis) as directed by Engineer- in- Charge with appropriate measuring instruments supplied by contractor.

All coated surfaces shall be free from flaking / peeling. Each shutter shall be clearly and legibly marked with the Manufacturer's Name or Trade Mark / Shutter Size / Year of Manufacture.

7.5.4 Electrical Operation of Rolling shutter

The rolling shutters shall be operated by electric motor actuators - operating on 415 Volts, 3-phase or 240 Volts, 1-phase - 50 Hz. AC supply.

All associated electrical components for motor control shall be compatible for working at the above mentioned voltage profile. The motor shall be of side-mounted type installed in alignment with the roller shaft inside the shaft-hood or adjacent to the rolling-shutter box. In either case, the rolling shutter motor & actuator assembly enclosure shall have IP-55 (or better) ingress protection against water & dust. The rolling shutter motor shall be rated for intermittent periodic duty (Duty Type – S3) or intermittent periodic duty with starting (Duty Type – S4). Arrangements shall also be made for emergency manual operation of the rolling shutter with mechanical reduction-gear, wheel & hand-chain override assembly - in the event of failure of the electric equipment or electricity.

For buildings in safe area, all electrical equipment's shall be in weatherproof executive with IP-54 protection for direct drive and IP 44 Protection for indirect drive ingress protection.

For buildings in hazardous are, if specified in Tender/MR, following shall be ensured:

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1. For hazardous area buildings, all electrical equipment's such as motor, actuators, push button control stations, PDB/Local panels etc. shall be flameproof type Exd suitable for applicable Gas Group and Temperature Class.

2. All hazardous area equipment shall have test certificates issued by recognised independent test house (CIMFR/ERTL/BASEEFA/LCEI/UL/FM/KLP or equivalent). All indigenous equipment shall conform to Indian standards and shall be certified by recognised testing agencies. All equipment (indigenous & imported) shall have valid statutory approval (e.g. PESO/DGMS etc.) as applicable for the specified location. All indigenous flameproof equipment shall have valid BIS license and marking as required by statutory authorities.

Make of all hazardous area equipment (for hazardous area building) and weatherproof equipment (for safe area building) shall be approved by owner / Engineer-In-Charge before selection & order placement. The motor shall be heavy duty type & sturdy - suitable for lifting shutters weighing up to 600 kilograms. The motors shall have BIS or equivalent approvals & relevant performance guarantee track records. The motor drive unit for the rolling shutter shall be complete with Drive-Chain / Gear, Plate-Wheel, Bush, Drive-Sprockets, mounting base-plates, integrated safety brakes & limit-switches, etc. Ideally all metallic components of the drive system shall be constructed out of non-corrosive high-grade stainless steel.The motor speed shall be regulated with gear drives such that the speed of the shutter (during up & down movement) for indirect drive shall be up to 0.05 m/s .The motor operating time within the intermittent duty cycle shall be long enough to ensure that the motor does not get heated up excessively, thereby resulting in tripping and / or damaging of motor windings for up to three continuous up & down (full height traverse) operation of the rolling shutter.

The motor shall be automatically protected from thermal overload by internal thermal probes / overload relays. The motor shall be compact and motor operation shall be with minimum of noise & vibration. Ideally, the motor controls (including motor-starter / over-load protections / contactors / etc) shall be placed within the motor-actuator enclosure.

The automation of the shutter shall have local control with a directional push button control station flush-mounted with the wall-surface, with 3 buttons marked UP, DOWN and STOP. The STOP Button must be of Mushroom-head type with lockable arrangement & push to release type. All the push-buttons shall be of latching type (single press & release) – without the need to continuously press the buttons during the traverse time of the shutter. The shutter traversing shall be prohibited if the STOP button is pressed & locked. The push-button unit shall have an enclosure with a minimum degree of IP-44 dust & water protection

7.5.5 Installation

Rolling shutters shall be installed true to the plane and fixed in the opening ensuring smooth operation as per IS 6248.

All fixing / mounting accessories shall be made of stainless steel only.

All necessary control wiring / cabling for the side-motor with the limit switches / controller panel shall be done with 3 / 5 core X 2.5 sq. mm. PVC insulated multi-stranded Copper Conductor armoured and flame retardant Low Smoke (FRLS) cables. All power cabling from PDB to the side motor shall be with 3 core X 4 sq. mm (minimum) Cu conductor, FRLS cable . Only fire rated & PVC insulated cables / wires with multi-stranded copper conductors shall be used for internal wiring of the motor / actuator / push-button. All cabling & wiring shall be concealed type with heavy-duty PVC conduits. Works include termination of the incoming power cable from the owner's Main Power Distribution Board to the motor / actuator /

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controller unit & all outgoing power & control cables from the controller panel to individual electrical components with supply & installation of cable glands & copper lugs of adequate sizes.

7.5.6 Mandatory & commissioning spares

The entire consignment of motorized rolling shutters for the shed / buildings shall be supplied with the following mandatory spares for each rolling shutter.

1. One set of the complete motor / actuator drive unit (of each rating) – duly assembled with limit switches, drive-chain / worm-gear, plate-wheels / bush / sprockets & mounting base-plates.
2. One set of motor controller (PCB / Controlling Unit).

8.0 MEASUREMENT

Doors, windows, ventilators and rolling shutters shall be measured in the following manner.

Pressed steel frames for doors	Length (vertical and horizontal members) in Running metres (RM)
Pressed steel door shutter	Actual shutter area in square metre (SqM)
Steel Windows/ ventilators with MS sections	Actual area of window/ ventilator in square metre (SqM)
Aluminium Doors/windows/ventilators	Aluminium sections by weight (Kg) Glazing - Actual area in square metre (SqM)
Rolling shutters	Actual area of Rolling shutter in square metre (SqM)
Loose hardware	In numbers

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पलस्तर एवं पॉइन्टिंग का मानक विनिर्देशन

STANDARD SPECIFICATION FOR PLASTERING & POINTING

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
					Approved by	
7	31.05.23	REVISED & ISSUED AS STANDARD SPECIFICATION	SANDEEP SHARMA	GURSHARAN JEET KAUR	SAMIR DAS	SANJAY MAZUMDAR
6	31.05.17	REAFFIRMED & ISSUED AS STANDARD SPECIFICATION	AM	JS/ JKB	R. SRIVASTAVA	R. NANDA
5	05.04.12	REVISED & ISSUED AS STANDARD SPECIFICATION	AM	SM	JKB	D. MALHOTRA
4	21.03.07	REVISED & ISSUED AS STANDARD SPECIFICATION	SD	JKB	ARVIND KUMAR	V.CHATURVEDI
3	10.03.99	REAFFIRMED AS STANDARD SPECIFICATION	SD	MLB	SCJ	AS
2	16.03.94	REVISED & ISSUED STANDARD SPECIFICATION	JS	JS	AKG	AS

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Abbreviations:

ASTM	:	American Standards of Testing of Materials
BS	:	British Standards
EN	:	European Standards
IS	:	Indian Standards
ISO	:	International Organization for Standardization
NBC	:	National Building Code of India

Architecture Standards Committee

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CONTENTS

1.0 GENERAL....4
2.0 REFERENCES....4
3.0 TYPE AND THICKNESS OF PLASTERING....4
4.0 MATERIALS....5
5.0 PLAIN CENENT PLASTER....7
6.0 CEMENT PLASTER WITH WATER PROOFING COMPOUND....7
7.0 SAND FACE PLASTER....7
8.0 EXPOSED AGGREGATE FINISH....7
9.0 APPLICATION OF PLASTER....8
10.0 GYPSUM PLASTER....10
11.0 READY MIX PLASTER....10
12.0 POINTING....11
13.0 MEASUREMENT....12

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1.0 GENERAL

1.1 This specification covers requirements of plastering and pointing in civil work, on building or Architectural or structural elements and as interior or exterior finishing or decorations etc.

1.2 Unless otherwise specifically mentioned in design basis, job specification, drawings, item descriptions etc. all masonry, block work, RCC surfaces shall be plastered.

2.0 REFERENCES

The codes and standards listed below contain provisions, which through reference in this specification constitute provisions of this standard specification, if not explicitly mentioned otherwise.

2.1 In case of similar codes of different organizations such as IS, ISO, BS, EN, BS-EN, ASTM, NBC etc. conformity with any of the similar codes is acceptable.

2.2 Reference codes and standards:

Standards	Document Title
IS: 1542	Sand for Plaster - Specification
IS: 1661	Code of Practice for application of cement and cement- lime plaster finishes
IS: 2114	Code of practice for laying in-situ terrazzo floor finish
IS: 2250	Code of Practice for Preparation and Use of Masonry Mortars
IS: 2386 (Part 2)	Methods of test for aggregates for Concrete Part II: Estimation of Deleterious materials and organic impurities
IS: 2402	Code of Practice for External Rendered Finishes
IS: 2542 (Part 1)	Methods of test for Gypsum plaster, Concrete and products, Part I - Plaster and Concrete
IS: 2547 (Part 2)	Specification for Gypsum building plasters, Part II - Premixed lightweight plasters.
IS: 2645	Integral waterproofing compounds for Cement Mortar and Concrete – Specification.
IS: 4031 (Part 1)	Methods of physical tests for hydraulic cement.

3.0 TYPE AND THICKNESS OF PLASTERING

3.1 Plastering shall be of plain cement plastering or plain cement plastering with waterproofing compound or Gypsum plastering or ready-mix plastering as mentioned in design basis, job specification, drawings, item descriptions etc.

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3.2 Unless otherwise specified in design basis, drawings, item descriptions, job specifications etc, the external surfaces shall be plastered with or plain cement plastering with waterproofing compound and internal surfaces shall be plastered with plain cement plastering.

3.3 Unless otherwise specified in design basis, drawings, item descriptions, job specifications etc, thickness of plastering shall be as per following table.

Type of plaster	Surface	Average thickness
Plain cement Plaster	Plumb surface of the internal masonry/ all block work walls & RCC Columns coming in line (flush) with this side of wall.	12 mm
Plain cement Plaster	Rough side of the internal masonry/ all block work walls & RCC Columns coming in line (flush) with this side of wall.	15mm
Plain cement Plaster with waterproofing compound	External surface	18 mm
Plain cement Plaster	Internal RCC surface	06 mm
Gypsum Plaster	Plumb surface of the internal masonry/ all block work walls & RCC Columns coming in line (flush) with this side of wall.	12 mm
Gypsum Plaster	Rough side of the internal masonry/ all block work walls & RCC Columns coming in line (flush) with this side of wall	12 -15 mm
Gypsum Plaster	Internal RCC surface	06 mm
Ready mix plaster	Similar to Plain cement plaster	Similar to plain cement plaster

Note:
However, if the undulation in the surface is beyond proper finishing with specified thickness of plaster, extra thickness of plaster shall be applied as required for proper finish without any extra cost.

4.0 MATERIALS

4.1 Cement

Cement shall conform to `Standard Specification for Civil and Structural Works- Materials' (Structural Specification no. 6-68-0002)

4.2 Sand

Sand for plaster and pointing shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these and shall conform to IS: 1542. Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of silt, day bails or pellets. Sand shall not contain harmful impurities such as iron pyrites, coal particles, lignite, mica shale etc in such form or in quantities as to affect adversely the hardening, strength or durability of the mortar.

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The maximum quantities of clay, fine silt, fine dust and organic impurities in the sand shall not exceed the following limits:

Clay, fine silt and fine dust when determined in accordance with IS 2386 (Part 2):

a. In natural sand or crushed gravel sand & crushed stone sand: Not more than 5% by mass

b. Organic impurities when determined in accordance with IS 2386 (Part 2): Color of the liquid shall be lighter than that indicated by standard specified in IS 2386 (Part-2)

Grading of sand for use in Plaster shall conform to IS 1542 (as below)

IS sieve designation	**Percentage passing**
10mm	100
4.75mm	95 to 100
2.36mm	95 to 100
1.18mm	90 to 100
600 micron	80 to 100
300 micron	20 to 65
150 micron	0 to 15

4.3 Water

Water for plastering and pointing shall conform to `Standard Specification for Civil and Structural Works- Materials' (Structural Specification no. 6-68-0002)

4.4 Cement Mortar

Cement mortar shall conform to `Standard Specification for Civil and Structural Works- Brick Masonry' (Structural Specification no. 6-68-0009) unless otherwise mentioned.

4.5 Cement Mortar with Waterproofing Compound

Waterproofing compound shall conform to IS: 2645 of approved make.

4.6 Gypsum Plaster

Gypsum plaster shall conform to IS 2542 (Part I) and IS 2547 (Part II). The plaster shall consist of retarded hemihydrate gypsum plaster and light weight aggregate. Other additions may be incorporated to impart desired properties.

4.7 Ready Mix Plaster

Ready Mix Plaster shall be ready mix cement plaster rendered with polymer additives, well graded sand and fillers. Compressive strength of the material shall be minimum 7.5 Mpa in 28 days as per IS: 2250.

Ready Mix Plaster shall be pre packed material requiring only water addition at site.

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5.0 PLAIN CEMENT PLASTER

5.1 The mortars of specified mix as per the specifications of 'Cement Mortar' (Refer clause 4.4) shall be used for plain cement plaster. Proportions of ingredients of cement mortar for various thicknesses of plaster shall be as per following table:

20mm thick plaster	1 cement: 6 sand (by volume), in two layers
18mm thick plaster	1 cement: 6 sand (by volume), in two layers
15mm thick plaster	1 cement: 4 sand (by volume)
12mm thick plaster	1 cement: 4 sand (by volume)
06mm thick plaster	1 cement: 4 sand (by volume)

6.0 CEMENT PLASTER WITH WATERPROOFING COMPOUND

6.1 The mortars of specified mix as per the specifications of 'Cement Mortar' (Refer clause 4.4) shall be used. Proportions of ingredients of cement mortar for various thicknesses of plaster shall be as per clause no 5.1

6.2 Waterproofing compound shall be mixed to cement mortar as recommended by the approved Manufacturer but @ 3% by weight as minimum.

7.0 SAND FACE PLASTER

7.1 Sand face plaster shall be 20mm thick consisting of 13 mm thick under layer and 7 mm thick top layer.

7.2 Under layer shall be 13 mm thick (1 cement: 4 sand, by volume) plain cement plaster.

7.3 Top layer shall be 7 mm thick (1 cement: 2 sand, by volume, granule size 2 to 2.5mm) plain cement plaster.

7.4 The mortars of specified mix as per the specifications of 'Cement Mortar' (Refer clause 4.4) shall be used for plain cement plaster.

7.2 Application of sand face plaster shall be as described in `two-layer plaster work' in clause no. 9.7. The surface of the sand face plaster shall be finished rough with sponge or as directed by the Engineer-in-charge.

8.0 EXPOSED AGGREGATE FINISH

8.1 Exposed aggregate finish plaster shall consist of 12 mm thick under layer and 20 mm thick top layer.

8.2 Under layer shall be 12 mm thick plain cement plaster (1 cement: 4 coarse sand, by volume) finished rough. The mortars of specified mix as per the specifications of 'Cement Mortar' (Refer clause 4.4) shall be used for plain cement plaster. The under layer shall be applied in accordance with `One layer plaster work' described in clause no. 9.6.

8.3 Top layer shall be 20 mm thick admixture of white cement and grey cement (mix. ratio 1:1 by volume) mixed with white/colored marble chips/pebbles (as required for desired shade/ colour

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of the finished surface) of 6mm to 12mm nominal size. Mix ratio shall be 1 cement: 1 marble chips/pebbles by volume. Marble dust @ 15% by volume with pigment (conforming to IS:2114, as required for obtaining desired colour/ shade of the finished surface) shall be added to the admixture.

The pebbles to be used shall be well washed and drained. The admixture shall be thrown wet on to the under layer while it is still plastic using strong whipping motion at right angles to the face of the wall.

One coat of neat cement slurry @ 2.75 kg cement per square meter of area shall be applied on to the under layer to receive the top layer.

The whole plastering shall be laid in panels of maximum 1200mm x 1200mm size or as per drawing with 12mm x 20mm grooves in between formed by holding removable wooden batons over the under layer.

Loose mortar etc. on the top surface shall be cleaned/removed by brushing/washing/spraying with water jet after initial setting of mortar.

9.0 APPLICATION OF PLASTER

9.1 Finishing

Plastered surface shall be plumb, without any undulations and defects such as cracks etc. Patterns/ grooves etc. shown in the drawing shall be provided. Any cracks, damages, any part of work which sound hollow when tapped or found damaged or defective otherwise shall be cut out in rectangular shape and redone as directed by Engineer-in-charge

9.2 Preparation of Background Surface

9.2.1 The background surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing.

9.2.2 Smooth surfaces shall be roughened by wire brushing or hacking for non-hard and hard surfaces respectively.

9.2.3 Projections on surfaces shall be trimmed wherever necessary to get even surfaces. In case of brick/stone masonry, raking of joints shall be carried out wherever necessary.

9.2.4 The background surface shall be allowed to dry out for sufficient period before carrying out the plaster work. The background surface shall not be soaked but only damped evenly thereafter before applying the plaster.

9.2.5 In case of concrete work, projecting blurs of mortar formed due to the gaps of joints in shuttering shall be removed. Such surface shall be scrubbed clean with wire brushes. The surface shall be pock marked with a pointed tool at spacing of not more than 50 mm centers, the pocks being made not less than 3 mm deep to ensure a proper key for the plaster. The surface shall be washed off and cleaned of all oil, grease etc. and well wetted before the plaster is applied.

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9.3 Sequence of Operations

9.3.1 The surfaces to be plastered, shall first be prepared as described in `Preparation of background surface' in clause no 9.2

9.3.2 For external plaster, the plastering operations shall be started from the top floor and carried downwards.

9.3.3 The first under layer shall then be applied to ceilings. After the ceiling plaster is complete and scaffolding for the same removed, plastering on wall shall be started.

9.3.4 After a suitable time interval, the secondary layers if required shall be applied. After a further suitable time interval, the finishing coat shall be applied first to the ceiling and then to the walls.

9.3.5 Plastering of cornices, decorative features, etc. shall be completed before the finishing coat is applied.

9.4 Scaffolding/Staging

Scaffolding/staging for plastering/pointing shall be as per `Standard Specification for Civil and Structural Works- Brick Masonry' (Structural Specification no. 6-68-0009)

9.5 Chicken Wire Mesh

150mm wide, closely knit, 20-gauge chicken wire mesh stretched tight and fixed with G.I. "U" type nails shall be provided at all the masonry/ block work and RCC joints.

9.6 One Layer Plaster Work

9.6.1 To ensure even, specified thickness, plaster of 150 mm x 150 mm shall be first applied horizontally and vertically at not more than 2-meter interval over the entire surface to serve as gauges.

9.6.2 The surface of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall be brought to true surface by working with a wooden straight edge reaching across the gauges with small upward and sideways movements at a time.

9.6.3 Finally the surface shall be finished off true with a trowel or wooden float to obtain a smooth texture. Excessive trowelling or overworking the float shall be avoided.

9.6.4 All corners, arises. angles and junctions shall be truly vertical/ horizontal and shall be carefully finished. Rounding or chamfering of corners, arises, junctions etc. shall be carried out with proper templates to the size required.

9.6.5 In suspending the work, the plaster shall be left cut clean to line, both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped clean and wetted before plastering the adjoining area.

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9.6.6 Plastering work shall be closed on the border of the wall and nearer than 150 mm to any corners or arises and shall not be closed on the body of the features such as plaster bands, cornices nor at the corners or arises.

9.7 Two Layer Plaster Work

9.7.1 The first or under layer of the specified thickness shall be applied as described in clause no. 9.6.

9.7.2 Before the first coat hardens, surface of it shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.

9.7.2 The second layer shall be complete to the specified thickness in the same manner as for first layer.

9.8 Curing of plaster

Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period the plaster shall be suitably protected from all damages at the contractor's expense by such means as approved by the Engineer-in-charge. The date of execution of plastering shall be marked on the plastering to ensure the proper duration of curing.

10.0 GYPSUM PLASTER

10.1 Gypsum plastering shall be done using premixed gypsum plaster and aggregates as mentioned in clause no. 4.6

10.2 Preparation of Gypsum plaster shall be in accordance with approved Manufacturer's standard and recommended practice. The powder (gypsum plaster) shall be mixed with clean water in clean plastic buckets to avoid mixing with impurities, ensuring thorough mixing by help of mixing rod so as to avoid formation of lumps and unmixed residues. The water to plaster ratio should be maintained as per approved manufacturer's specification.

10.3 Application of Gypsum plaster shall be in accordance with clause nos. 9.1 to 9.7

10.4 Curing

There is no requirement of curing. Gypsum plaster dries in 3 days, after which painting can be done directly over the finished surface.

11.0 READY MIX PLASTER

11.1 Ready-mix plastering shall be done using pre packed plaster ingredients as mentioned in clause 4.7

11.2 The powder (ready mix) shall be mixed with clean water, preferably in clean plastic buckets to avoid mixing with impurities, ensuring thorough mixing by help of mixing rod or mechanical

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stirring for 2-3 minutes as to avoid formation of lumps and unmixed residues. The water to plaster ratio shall be maintained as per approved manufacturer's specification.

11.3 Application of ready-mix plaster shall be in accordance with clause nos. 9.1 to 9.7. The plaster mix shall be applied within the time (after preparation of the mix) recommended by the approved Manufacturer. Curing shall be done in accordance with clause no 9.8 or as recommended by the approved Manufacturer as approved by the Engineer-In-Charge.

11.4 Curing

Curing shall be done in accordance with clause no 9.8 or as recommended by the approved Manufacturer and as approved by the Engineer-In-Charge.

12.0 POINTING

Pointing shall be of the type specified such as flush, cut or weather struck, raised and cut etc.

12.1 Preparation of Base Surface

The joints shall be raked to such a depth that the minimum depth of the new mortar measured from either the sunk surface of the finished pointing or from the edge of the brick shall be less than 20 mm.

12.2 Cement Mortar

Cement Mortar shall be in accordance with the specifications of cement mortar described in clause no. 4.4.

12.3 Application of Mortar and Finishing

The cement mortar (1 cement: 4 sand, by volume) shall be pressed into the raked out joints with a pointing trowel according to the type of pointing specified. The mortar shall be spread over the corner edges or surfaces of the masonry. The pointing shall then be finished with the pointed tool. The superfluous mortar shall be cut off from the edges.

12.4 Flush Pointing

The cement mortar shall be pressed into joints and shall be finished off flush and leveled. The edges shall be neatly trimmed with trowel and straight edges.

12.5 Cut or Weather Struck Pointing

The mortar shall first be pressed into joints. The top of the horizontal joints shall then be neatly pressed back by about 15 mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall also be similarly pointed. The junctions of vertical joints with the horizontal joints shall be at true right angles in case of brick & coursed rubble masonry.

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12.6 Raised and Cut Pointing

This type of pointing shall project from the wall facing with its edges cut parallel so as to have a uniformly raised band about 6 mm and width 10 mm more as directed. The pointing shall be finished to a smooth but hard surface.

12.7 Curing

Curing shall be as described in clause no. 9.8

13.0 MEASUREMENT

13.1 Plastering shall be measured by the area of actual plastered surface.

13.2 Pointing shall be measured by the actual area of the surface on which pointing is done.

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STANDARD SPECIFICATION FOR ROOF TREATMENT

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved By	
8	09.03.26	REVISED & ISSUED AS STANDARD SPECIFICATION	PIYALEE DAS	ATUL GUPTA	ANISH KUNDU	NALIN KUMAR
7	10.05.22	REVISED AND ISSUED AS STANDARD SPECIFICATION	SS	AK	SD	SANJAY MAZUMDAR
6	23.02.18	REVISED AND ISSUED AS STANDARD SPECIFICATION	SG	JS/SD	RS	R NANDA
5	15.05.12	REVISED AND ISSUED AS STANDARD SPECIFICATION	MKV	SM	JKB VK	D MALHOTRA

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Abbreviations:

ASTM	:	American Standards of Testing of Materials
BS	:	British Standards
EN	:	European Standards
IS	:	Indian Standards
ISO	:	International Organization for Standardization
NBC	:	National building Code
NFPA	:	National Fire Protection Association
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
PUF	:	Polyurethane
CuM	:	Cubic Meter
GSM	:	Grams per square meter
PCC	:	Plain cement concrete
Sq.M	:	Square meter
MPa	:	Mega Pascal

Architecture Standards Committee

Convenor: Mr. Anish Kundu

Members:
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Ms. Maitrayee Majumder (Strl)
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CONTENTS

1.0 GENERAL 4
2.0 REFERENCES 4
3.0 ROOF WATERPROOFING SYSTEMS 5
4.0 POLYMER MODIFIED BITUMINOUS ROOF WATER PROOFING....5
5.0 POLYURETHANE (PU) WATERPROOF COATING (SINGLE COMPONENT)....8
6.0 WATERPROOFING CUM INSULATION SYSTEM 12
7.0 DELIVERABLES BY THE CONTRACTOR....18
8.0 WARRANTY....18
9.0 MEASURMENT....18

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1.0 GENERAL

This standard specification lays down requirements of water proofing treatment for RCC roofs and terraces of buildings.

2.0 REFERENCES

2.1 The codes and standards listed below contain provisions which through reference in this specification constitute provisions of this standard specification if not specifically mentioned otherwise.

2.2 In case of similar codes of different organizations such as IS, ISO, BS, EN, BS-EN, ASTM, NFPA, NBC etc. conformity with any of the similar codes is acceptable.

2.3 Reference codes and standards:

Standards	Document title
ASTM C165	Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C177	Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C423	Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
ASTM C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C836	Standard Specification for High Solids Content, Cold Liquid- Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
ASTM C1363	Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
ASTM D5	Standard Test Method for Penetration of Bituminous Materials
ASTM D36	Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
ASTM D41	Standard Specification for Asphalt Primer Used in Roofing, Damp-proofing, and Waterproofing
ASTM D146	Standard Test Methods for Sampling and Testing Bitumen- Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D1621	Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	Standard Test Method for Apparent Density of Rigid Cellular Plastics
ASTM D1623	Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
ASTM D1970	Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D2842	Standard Test Method for Water Absorption of Rigid Cellular Plastics
ASTM D6226	Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM D7425	Standard Specification for Spray Polyurethane Foam Used for Roofing Applications
IS 3384	Bitumen primer for use in waterproofing and damp-proofing
IS12432 (Part-3)	Indian Standard Application of Spray Applied Insulation - Code of Practice

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3.0 ROOF WATER PROOFING SYSTEMS

3.1 General

3.1.1 Roof waterproofing system shall be a complete system including base preparation and top finishing ensuring leak proof, water tight roof/ terrace surface and efficient rain water drainage. Following types of roof waterproofing systems shall be provided as specified in design basis, job specifications, item descriptions, drawings etc.

1. Polymer modified bituminous (APP) roof waterproofing system.
2. Polyurethane (PU) coating (single component) waterproofing system.
3. Waterproofing cum insulation system.

If roof waterproofing system is not mentioned specifically, the roofing treatment system shall be provided as below:

1. Polymer modified bituminous (APP) roof waterproofing system shall be provided in case of buildings which are not centrally air conditioned.
2. For centrally air-conditioned buildings, Waterproof cum insulation system shall be provided.

3.1.2 The roof waterproofing system shall be leak-proof, water tight, properly finished and levelled with necessary slope for efficient roof water drainage.

3.1.3 All waterproofing materials of the system shall be from a single approved Manufacturer. Mix of waterproofing materials procured from different Manufacturers shall not be permitted.

3.1.4 The roof waterproofing system shall be laid by agencies approved by Engineer-In-Charge.

4.0 POLYMER MODIFIED BITUMINOUS (APP) ROOF WATER PROOFING SYSTEM

APP (Atactic Polypropylene polymer) roof waterproofing system shall consist of primer coat, Bituminous (APP) membrane and a top protective finishing layer.

4.1 Materials

4.1.1 Primer

Bituminous solvent-based primer of approved quality conforming to IS: 3384 or ASTM D41.

4.1.2 Bituminous membrane for waterproofing

Bituminous membrane for waterproofing shall be 4 mm thick prefabricated polymer (APP-Atactic Polypropylene) modified and shall be reinforced with nonwoven Polyester and shall have following properties.

Property	Value	Testing Method
Thickness	4 mm	ASTM D751
Penetration at 25deg. C, 100g, 5 seconds	25 +/- 5 mm	ASTM D5
Softening point	110 to 155 deg C	ASTM D36
Low Temp. Flexibility	-2 deg C to -10 deg C	ASTM D1970
Tensile strength		
-Longitudinal	> 500 N/ 5cm	ASTM D146

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-Transverse	> 450 N/ 5cm	ASTM D146
Elongation		
-Longitudinal	> 40%	ASTM D146
-Transverse	> 40%	ASTM D146
Water absorption	0.12% max.	ASTM D570

4.1.3 Top protective finishing layer

Top protective layer shall be of PCC (plain cement concrete – 1 cement: 2 coarse sand: 4 aggregate) with 24 SWG chicken wire mesh. Thickness of the layer shall be minimum 50 mm.

4.2 Workmanship

4.2.1 The waterproofing system shall be laid in accordance with approved Manufacturer's standard practice as approved by Engineer-In-Charge and following clauses.

4.2.2 In order to avoid damages in the roofing system, the system shall be laid after the pedestals, structures etc. to be placed on the roof/ terrace are done.

4.2.3 Any pipes or openings / protrusions which are required to be provided on the roof shall be provided prior to taking up the base surface preparation.

4.2.4 The system application shall be done at suitable weather condition as mentioned/ recommended in the product data sheet etc. of the materials / system.

4.2.5 Base surface preparation

a. The entire base surface of the roof/ terrace shall be thoroughly cleaned with wire brush or mechanically and all foreign matter including loose concrete etc. shall be removed.

b. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up with polymerised mastic or a paste of liquid single component elastomeric waterproofing and fine sand mix or with Polysulphide Sealant.

c. Potholes or depressions shall be filled up after removing weak cement concrete or cement plaster etc. with PCC (1 cement :1.2 coarse sand :3.5 stone aggregate of 6mm & down size by volume,) laid over a coat of neat cement slurry @2.75 Kg of cement per Sq.M of area, to achieve a smooth prepared surface.

d. The finished surface shall be perfectly dry and any dampness should be allowed to evaporate

4.2.6 Primer coat

a. The Bituminous solvent-based primer shall be applied over the entire area to be waterproofed including abutting vertical surfaces.

b. Primer coat shall be cold applied. Minimum coverage shall be 0.2 to 0.4 litre per square metre.

c. The primer coat shall be allowed to dry for minimum 24 hours.

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4.2.8 Fixing of APP membrane

a. The APP polymer modified bituminous membrane shall be laid over the primer coat by torch welding. The membrane shall be properly pressed during laying to remove any entrapped air.

b. The joints should be sealed properly with necessary side laps of 100 mm and end laps of 150 mm.

c. The membrane shall be continued along the vertical surfaces up to a minimum height of 300mm above the fillet/ coving. The continued membrane shall be terminated in minimum 20 mm x 10 mm chase to be provided in the vertical surface and shall be sealed with approved quality polyurethane sealant. Alternatively, the membrane can be continued over the entire vertical surface and suitably covered by coping at top.

d. After the membrane is laid, water ponding test for leakage shall be done on waterproof treated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 metre x 2 metre and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge

4.2.9 Top protective finishing layer

a. The top protective finishing layer of PCC (minimum 50 mm thick) with chicken wire mesh shall be laid over APP membrane without sprinkling of clean sand. The finished surface shall be in desired slope.

b. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces.

c. PCC shall be laid in panels of maximum 1200 x 1200 mm size.

e. The PCC layer and the angular fillet/ coving shall be cured in accordance with regular concrete curing practices.

f. The joints between panels shall be raked out neatly (after stipulated curing period) to a minimum 10mm X 10mm V groove and shall be filled up approved quality polyurethane sealant.

e. Khura (minimum size 450 mm x 450 mm) shall be provided at every rain water outlets.

4.2.10 Finishing of waterproofing treatment over parapets/ vertical surfaces

APP membrane continued over parapets/ vertical surfaces shall be finished with minimum 12 mm thick plaster.

4.2.11 Waterproofing treatment in RCC gutters

a. Water proofing treatment over Parapets/ Vertical surfaces of gutter shall comprise of APP membrane continued over parapets/ vertical surfaces finished with minimum 12 mm thick plaster.

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b. Waterproofing treatment on horizontal surface of gutter shall comprise of APP waterproofing membrane and top finishing layer of plaster or PCC as approved.

c. Base horizontal surface shall be prepared in accordance with clause 4.2.5

d. APP membrane over roof surface shall be continued over the sloped surface and continued on vertical parapet of the gutter and inside the rain water pipes similar to roof application of the APP membrane.

e. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces.

f. After the membrane is laid, water ponding test for leakage in the gutter shall be done as directed by Engineer-In-Charge by making sand/mud bundhs and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

g. APP membrane shall be finished with minimum 12 mm thick plaster or PCC as approved. PCC shall be laid in accordance with clause 4.2.9

4.3 Testing

Test for leakage shall be done as follows:

After the APP membrane is laid, water ponding test for leakage shall be done on waterproof treated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 meter x 2 meter and water ponding for minimum 72 hours.
Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

5.0 POLYURETHANE (PU) COATING (SINGLE COMPONENT) WATERPROOFING SYSTEM

Single component PU waterproofing system shall consist of primer coat, PU waterproof coating, Geo-textile membrane and a top protective finishing layer.

5.1 Materials

5.1.1 Primer

Primer shall be polyurethane primer compatible to single component Polyurethane water proofing coating (which shall be applied over the primer) and shall be as per approved Manufacturer/ system provider's standard specification and as approved by Engineer-In-Charge.

5.1.2 Polyurethane (PU) water proofing coating

Polyurethane water proofing coating/ membrane shall be single component (moisture cured, elastomeric, free from bitumen and tar) viscous liquid containing urethane polymers having following properties:

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Property	Value	Testing Method
Solid content	Minimum 85%	ASTM C 836
Elongation	Minimum 400%	ASTM D 412
Tensile Strength	2-3 MPa	ASTM D 412

5.1.3 Geo-textile membrane

Geo textile membrane shall be of 150 GSM (grams per square meter) as per approved Manufacture/ system provider's specification and as approved by Engineer-In-Charge.

5.1.4 Top protective finishing layer

Top protective layer shall be of PCC (plain cement concrete – 1 cement : 2 coarse sand : 4 aggregate) with 24 SWG chicken wire mesh. Thickness of the layer shall be minimum 50 mm.

5.2 Workmanship

5.2.1 The waterproofing system shall be laid in accordance with approved Manufacturer's standard practice as approved by Engineer-In-Charge and following clauses.

5.2.2 In order to avoid damages in the roofing system, the system shall be laid after the pedestals, structures etc. to be placed on the roof/ terrace are done.

5.2.3 Any pipes or openings / protrusions which are required to be provided on the roof shall be provided prior to taking up the base surface preparation.

5.2.4 The system application shall be done at suitable weather condition as mentioned/ recommended in the product data sheet etc. of the materials / system.

5.2.5 Base surface preparation

a. The entire base surface of the roof/ terrace shall be thoroughly cleaned with ire brush or mechanically and all foreign matter including loose concrete etc. shall be removed.

b. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up with polymerised mastic or a paste of liquid single component elastomeric waterproofing and fine sand mix or with Polysulphide Sealant.

c. Potholes or depressions shall be filled up after removing weak cement concrete or cement plaster etc. with PCC (1 cement :1.2 coarse sand :3.5 stone aggregate of 6mm & down size by volume,) laid over a coat of neat cement slurry @2.75 Kg of cement per Sq.M of area, to achieve a smooth prepared surface.

d. The finished surface shall be perfectly dry and any dampness should be allowed to evaporate

5.2.6 Primer coat

Polyurethane primer shall be brush applied @ 6-8 square meter area/ Litre over the entire prepared roof surface.

5.2.7 Polyurethane (PU) water proofing coating

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a. Polyurethane water proofing coating of specified thickness shall be spray or brush applied as directed by Engineer-In-Charge in minimum two layers over primer. If thickness is not mentioned specifically, thickness shall be minimum 1.5 mm DFT (dry film thickness)

b. Scrim cloth reinforcement shall be provided in between the layers. Scrim cloth reinforcement shall also be provided in places where there is a change in surface profile. eg. junction of horizontal and vertical surface of wall, pedestal etc and also near openings for rainwater pipe etc. Scrim cloth to be placed for a distance of 150 mm on either side of junction. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

c. The coating shall be properly cured.

d. After the waterproofing coating is cured, water ponding test for leakage shall be done on waterproof coated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 metre x 2 metre and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

5.2.8 Top protective finishing layer

a. Geo textile member shall be provided over the cured PU coating as a separation layer for subsequent PCC layer after emptying the water used for ponding test for leakage.

b. The top protective finishing layer of PCC (minimum 50 mm thick) with chicken wire mesh shall be laid over Geo textile member. The finished surface shall be in desired slope.

c. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces.

d. PCC shall be laid in panels of maximum 1200 x 1200 mm size.

e. The PCC layer and the angular fillet/ coving shall be cured in accordance with regular concrete curing practices.

f. The joints between panels shall be raked out neatly (after stipulated curing period) to a minimum 10mm X 10mm V groove and shall be filled up approved quality polyurethane sealant.

g. Khura (minimum size 450 mm x 450 mm) shall be provided at every rain water outlets.

5.2.9 Waterproofing treatment over parapets/ vertical surfaces on roof

Waterproofing treatment over Parapets/ Vertical surfaces shall comprise of Polyurethane water proofing coating (refer clause 5.1.2) over primer coat (refer clause 5.1.1) finished with cement plaster. Sand shall be sprinkled over the Polyurethane water proofing coating when still in tacky state, to form key for holding cement plaster finishing on polyurethane waterproofing coating.

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a. Entire surface shall be prepared in accordance with clause 5.2.5

b. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces. The angular fillet/ coving shall be cured by means of regular wetting.

c. Polyurethane Primer coat shall be applied over the prepared surface in accordance with clause 5.2.6.

d. The Polyurethane water proofing coating (minimum 1.5mm DFT -Dry Film Thickness) applied on roof shall be continued over parapet/ vertical surface over the primer coat.

e. The Polyurethane water proofing coating shall be continued over vertical surface as per drawing or as directed by Engineer-In-Charge subjected to upto minimum 300 mm height from the finished roof surface.

f. Scrim cloth reinforcement shall be provided in between the layers of the coating and in places where there is a change in surface profile. eg. junction of horizontal to vertical surfaces and also near openings for rainwater pipes/ outlets etc. Scrim cloth shall be placed for a distance of 150 mm on either side of junction.

g. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

h. The coating shall be properly cured.

5.2.10 Finishing of parapet/ vertical surfaces

a. Sand shall be sprinkled over the Polyurethane water proofing coating when still in tacky state, to form key for holding cement plaster finishing on polyurethane waterproofing coating.

b. Minimum 12mm thick cement plaster (1 cement: 4 sand, with polypropylene fibers @ 125 gms per bag of cement or as per recommended dosage by manufacturer to avoid cracking and disintegration) finishing shall be provided over the Polyurethane water proofing coating.

5.2.11 Roofing treatment in concrete gutters

a. Roofing treatment over Parapets/ Vertical surfaces of gutter shall comprise of Polyurethane water proofing coating over primer coat finished with minimum 12mm thick cement plaster similar to clause 5.2.9 & 5.2.10. The treatment shall be done on entire vertical surfaces/Parapet including gutter facia top.

b. Roofing treatment on horizontal surface of gutter shall comprise of Polyurethane water proofing coating over primer coat, Geotextile membrane and top finishing layer of plaster or PCC as approved.

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c. Entire surface shall be prepared similar to the base surface preparation of roof surface.

d. Necessary slope shall be provided by means of PCC or approved light weight material such as cinder concrete.

e. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces. The angular fillet/ coving shall be cured by means of regular wetting.

f. Polyurethane Primer coat as per clause 5.1.1 shall be applied over the prepared surface in accordance with clause 5.2.6.

g. The Polyurethane water proofing coating (Minimum 1.5mm DFT -Dry Film Thickness) applied over roof shall be continued over horizontal and parapet/ vertical surface of gutter in accordance with clause 5.2.7 over the primer coat.

h. Scrim cloth reinforcement shall be provided in between the layers and in places where there is a change in surface profile. eg. junction of horizontal to vertical surfaces and also near openings for rainwater pipes/ outlets etc. Scrim cloth shall be placed for a distance of 150 mm on either side of junction.

i. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

j. The coating shall be properly cured.

k. After the waterproofing coating is cured, water ponding test for leakage in the gutter shall be done as directed by Engineer-In-Charge by making sand/mud bundhs and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

l. PU waterproof coating shall be finished with minimum 12 mm thick plaster or PCC as approved. PCC shall be laid in accordance with clause 5.2.8.

5.3 Testing

Test for leakage shall be done as follows.

After the waterproofing coating is cured, water ponding test for leakage shall be done on waterproof coated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 meter x 2 meter and water ponding for minimum 72 hours.

Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

6.0 WATERPROOFING CUM INSULATION SYSTEM

Waterproofing cum Insulation system shall consist of primer coat, Polyurethane foam insulation, PU waterproof coating, Geo-textile membrane and a top protective finishing layer as below:

Layer	Material
1st layer	Polyurethane primer coat
2nd layer	Minimum 1.5 mm DFT (Dry Film Thickness) single component Polyurethane (PU) water proofing coating – base coat

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Location: eProcure-EPROC