Format no: G-02
FIELD PAINTING PRIMER/FINISH PAINT OF EQUIPMENT

PROJECT :										FORMAT NO :	
Name of Work :										REPORT NO :	
FOA No :											
Drawing :	JOB No :									DATE :	
Surface Preparation Method :-			Type of Primer/Finish Paint/Shade :-							Application Method :	
Surface Preparation Standard :-										Paint Manufacturer :	
Blasting Type:-			Batch No:							BT Certificate No :	
(Shot & Grit/Copper Slag/Sand)			Base :							Shelf Life :	
B.T Certificate No of Shot & Grit:-			Hard :								
Calib. Certificate No: 1) Profile :-						2) DFT Meter :-					

EQUIPMENT NO:								DESIGN TEMP :			
Primer :-1st Coat				Finish Paint: 1st Coat				Finish Paint: 2nd Coat			
Humidity :				Humidity :				Humidity :			
Temperature :				Temperature :				Temperature :			
Dew point :				Dew point :				Dew point :			
Weather Condition :				Weather Condition :				Weather Condition :			
Type of Paint	DFT	Acceptance		Type of Paint	DFT	Acceptance		Type of Paint	DFT	Acceptance	
		Contractor	EIL			Contractor	EIL			Contractor	EIL
Contractor								EIL			
Signature :								Signature :			
Name :								Name :			
Date :								Date :			

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Format no: G -03, FIELD PAINITNG PRIMER/FINISH PAINT (PIPING)

Drawing No.								Location					
Specification No.								Report No.					
Procedure								Dated					
Job Description :													
Daily weather record :													
Time	Relative Humidity		Ambient temperature		Surface temperature			Dew point temperature			Weather condition		
Surface preparation													
a) Method													
	Blasting		Power tool		Hand clean		Solvent		Emery cloth		Other		
b) Blasting details													
	Abrasive		Sand		Grit		Shot		Certificate No.				
c) Surface standard													
	ISO 8501-1/SIS-05 5900/SSPC-SP			Others		Profile Micron			Result : Accepted /Rejected				
Painting material and application method : Painting System - Temp. Range -													
	Material brand		Manufacturer		Certificate No.		Batch No.		Shelf life upto		Shade/ Colour		Application
Base													
Hardener													
Primer (1st coat)													
(2nd coat)													
Paint (1st coat)													
(2nd coat)													

Painting Inspection Record :

Item	Area/Joint		Coating Layer	Wet Film Thickness		Dry Film Thickness		Completion of hydrostatic testing	Visual Inspection	Acceptance
	From	To		Measurements 1,2,3...	Minimum Reqd.	Measurements 1,2,3...	Minimum Reqd.			
			Primer							
			1st coat (intr)							
			2nd coat (intr)							
			Finish							
			1st coat							
			2nd coat							

Identification colour band & direction marker : Accepted/ Not Accepted

NOTE: All blasting and coating materials shall be approved by EIL/Owner. All measuring and testing equipment's shall have valid calibration certificate and shall adhere to relevant specifications.

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Format no: G -04, INSPECTION REPORT FOR INSULATION WORK – EQUIPMENT

PROJECT :			FORMAT NO :
Name of Work :			REPORT NO :
FOA No :			
Drawing :			DATE :
DRAWING NO :			REV.
GRID NO :	ZONE		ELEVATION

SURFACE PREPARATION (Dryness, paint etc.):- Accepted /Not accepted VISUAL INSPECTION :- Accepted /Not accepted

SL NO	ACTIVITY & ITEM NO	Visual Inspection	SURFACE AREA INSULATED			REMARK
			FROM	TO	SURFACE AREA (SQM)	
1	Lagging of Insulation Materials					
	Thickness of Insulation					
	Moisture barrier, if applicable					
	Heat Tracer Putty application, if applicable					
2	Sheeting / Cladding work					
3	Miscellaneous					
	a) Inspection window					
	b) Valve boxes					
	c) Flange covers					
	d) Expansion joints					
	e) SS Foil for SS Piping					
4	For COLD INSULATION					
	a) Wooden support	ACCEPTED / NOT ACCEPTED				
	b) Vapour barrier	ACCEPTED / NOT ACCEPTED				
	c) Vapoursealant	ACCEPTED / NOT ACCEPTED				
	d) Insul. Coat	ACCEPTED / NOT ACCEPTED				

HOT INSULATION (Visual & position of seam to prevent water penetration) ACCEPTED / NOT ACCEPTED
COLD INSULATION (Visual & Sealing) ACCEPTED / NOT ACCEPTED
FINAL FINISH ACCEPTED / NOT ACCEPTED

	Contractor	EIL
Signature :		
Name :		
Date :		

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Format no: G - 05
INSPECTION REPORT FOR INSULATION WORK - PIPING

PROJECT :		FORMAT NO :	
Name of Work :		REPORT NO :	
FOA No :			
Drawing :		DATE :	
SURFACE PREPARATION (Dryness, paint etc.):- Accepted /Not accepted		VISUAL INSPECTION :- Accepted /Not accepted	

SR. NO.	LINE NO.	DIA	R.Mtr.	OP. TEMP	INSULATION		SPACER RING			MOISTURE BARRIER		HEAT TRACER PUTTY APPLICATION			FIXING OF ALUMINIUM SHEET			REMARKS
					TYP	THK	QTY	Cont.	EIL	CONT.	EIL	QTY	CONT.	EIL	QTY	CONT.	EIL	

REMARKS:

	CONTRACTOR	EIL
Signature		
Name		
Date		

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फील्ड इंस्ट्रूमेंटेशन कार्यों (ईपीसीसी/एकमुश्त टर्नकी संविदाओं) के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP) FOR FIELD INSTRUMENTATION WORKS (EPCC/LSTK CONTRACTS)

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
4	18.09.2023	REVISED AND REISSUED	DJ	DG	RKS	SM
3	27.07.2018	REVISED AND REISSUED	SKG	AP	AKK	RKT
2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	24.08.2006	ISSUED AS STANDARD SPECIFICATION	AS	MPJ	VNP	VJN

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Abbreviations:

A/G	:	Above Ground
AS	:	Alloy Steel i.e. Cr-Mo steels like A335 Gr P11, P5, P9, P22, etc.
CS	:	Carbon Steel
CSO	:	Car Seal Open
DCS	:	Distributed Control System
DPT	:	Dye Penetration Testing
FTB	:	Field Terminal Block
GAD	:	General Arrangement Drawings
HIC	:	Hydrogen Induced Cracking
ITP	:	Inspection & Test Plan
JB	:	Junction Box
LCP	:	Local Control Panel
LO/ LC	:	Lock Open/ Lock Close
MPI	:	Magnetic Particle Inspection
MT	:	Magnetic Particle Testing
NACE	:	National Association of Corrosion Engineers
NDT	:	Non Destructive Testing
NRV	:	Non Return Valve
P&ID	:	Piping & Instrumentation Diagrams
PLC	:	Programmable Logic Controller
PMI	:	Positive Material Identification
PMS	:	Piping Material Specification
PQR	:	Procedure Qualification Record
PT	:	Penetrant Testing
PVC	:	Poly Vinyl Chloride
PWHT	:	Post Weld Heat Treatment
QA/QC	:	Quality Assurance/ Quality Control
RF	:	Reinforcement
SS	:	Stainless Steel like A312 TP 304, 316, 321, 304L, 316L, 316Mo, etc.
SSCC	:	Sulphide Stress Corrosion Cracking
WPS	:	Welding Procedure Specification

Construction Standards Committee

Convenor: Sh. Rupesh Kumar Singh , ED (Construction)

Members: Sh. Janak Kishore, ED (Projects),
Sh. Chinmoy Kapuria, CGM (SCM),
Sh. Udayan Chakravarty, Sr. GM (Piping),
Sh. Debasish Ghosal, GM (Construction),
Sh. Pankaj Kumar Rai, DGM (Construction),

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2.	Fabrication and erection of cable ducts	2604	7
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4.	Fabrication, installation of instrument support/ stanchions, panel supports, canopies, JB supports	2606	9
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GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : **Hold Point ;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : **Witness Point;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw : **Review** of Contractor's documentation.

S : **Surveillance** Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records.

WC : **100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages

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ITP NO: 2603

CALIBRATION OF INSTRUMENTS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Availability of approved standard calibrated testing equipment having test certificates from approved lab and validity of calibration.	WC	HP
2.	Dust free environment	WC	S
3.	Availability of approved data sheets, calibration procedures, standards, vendor's manuals	WC	Rw
4.	Usage of appropriate tools and tackles	WC	S
5.	Mounting of instruments, instrument tag & model	WC	S
6.	Checking of instrument ranges, supply & output for proper connections	WC	S
7.	Calibration of local gauges	WC	Rw
8.	Calibration of electronic instruments	WC	S
9.	Calibration/ stroke checking of Control Valves	WC	S
10.	Calibration of safety valves, shut down valves and trip switches or transmitters	WC	S
11.	Calibration of special level instruments i.e. Radar type/ float type instruments	WC	S
12.	Calibration of Gas Detector/ Hydrogen Detector/ Flame Detector etc. with valid calibration gas	WC	S
13.	Ensuring procedure & record	WC	Rw
14.	Plugging of spare entries	WC	S
15.	Stamping of calibration date on instruments	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection documents	WC	Rw

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ITP NO: 2604

ERECTION OF DUCT SUPPORT AND CABLE DUCTS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material Inspection	WC	Note 1
2.	Use of approved consumables	WC	S
3.	Correctness of dimensions and thickness of duct	WC	S
4.	Welding as per standards/ specifications	WC	S
5.	Installation & alignment of support as per structural drawings and documents	WC	S
6.	Painting of cable duct and support	WC	S, Note 2
7.	Grinding of sharp edges before erection	WC	--
8.	Alignment of cable duct	WC	S
9.	Covering of duct after completion of cable laying/ dressing	WC	S
10.	Fire Proofing of cable duct (as applicable)	WC	S
11.	Usage of appropriate clamp & fasteners	WC	S
12.	Installation of guide supports	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.
2) For cleaning & painting, please refer ITP No. 2501 (Standard no 6-82-2500)

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ITP NO: 2605

FABRICATION, ERECTION OF CABLE TRAYS, ANGLE TRAYS FOR CABLE AND TUBE LAYING.

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material Inspection	WC	Note 1
2.	Correct size and routing of tray/ angle	WC	S
3.	Ensure separation of cable trays for power & signal/ Thermocouple cables	WC	S
4.	Supports as per standards/ specifications	WC	S
5.	Removal of sharp edges and sharp bends	WC	--
6.	Fastening/ welding of trays/ angles	WC	S
7.	Fire Proofing of cable duct (as applicable)	WC	S
8.	Check for fouling with piping & structures	WC	S
9.	Check for any obstruction/ free access for maintenance	WC	S
10.	Painting of trays/angle and support	WC	S, Note 2
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note :1) For incoming material inspection please refer ITP no: 6-82-1010.
2) For cleaning & painting, please refer ITP No. 2501 (Standard no 6-82-2500)

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ITP NO: 2606

FABRICATION, INSTALLATION OF INSTRUMENT SUPPORT/ STANCHIONS, PANEL SUPPORTS, CANOPIES, JB SUPPORTS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material Inspection	WC	Note 1
2.	Availability of approved junction box layout and Instrument location plan	WC	Rw
3.	Location of Junction Box & Instrument Stanchions (As per installation standards)	WC	S
4.	Correctness of dimensions, height, etc.	WC	S
5.	Approved welder, consumables, standards	WC	Rw
6.	Check for installation of support as per standard	WC	S
7.	Removal of sharp edges	WC	--
8.	Painting	WC	S, Note 2
9.	Easy access from O&M point of view	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.
2) For cleaning & painting, please refer ITP No. 2501(Standard no 6-82-2500)

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ITP NO: 2607

INSTALLATION OF FIELD INSTRUMENTS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Availability of approved location plans, piping GADs, P&ID, vendor's manual, etc.	WC	Rw
2.	Installation of proper support/ instrument stanchion, canopy	WC	S
3.	Instrument tag as per P&ID and model & make as per instrument data sheet	WC	S
4.	Alignment of the instruments	WC	S
5.	Mounting of accessories as per instrument data sheet	WC	S
6.	Visibility & maintenance clearance	WC	S
7.	Installation of canopy	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

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ITP NO: 2608

INSTALLATION OF IMPULSE TUBING

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Availability of approved Installation Standards, BOM, PMS & Procedure	WC	-	Rw	Rw
2.	Direction of flow, tapping orientation, standard , piping/tubing materials	WC	W	S	S
3.	Upstream & downstream straight runs	WC	S	S	S
4.	Removal of burrs & sharp edges on tube bends	WC	-	-	-
5.	Smooth bends/ free draining	WC	S	-	-
6.	Ferrule punching	WC	S	S	S
7.	Supports as per standards/ specifications	WC	S	S	S
8.	Direction of valves/ valve manifolds	WC	S	S	S
9.	Usage of approved sealant, etc	WC	Rw	Rw	-
10.	Hydrostatic/ pneumatic testing	WC	W	S	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Document	WC	Rw		

CAT A: All services involving hydrogen and hydrogen containing fluids, All impulse piping for 600# rating & above All SS, AS, NACE, LTCS impulse piping

CAT B: All CS impulse piping for process lines below 600 # rating

CAT C: Piping for "D" class fluid (Utility lines other than steam lines), Non IBR portion of condensate & steam lines

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ITP NO: 2609

CABLE LAYING, GLANDING AND TERMINATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming Material Inspection for Cables, Glands etc.	WC	Note 1
2.	Correctness of cable type as per schedule	WC	S
3.	Measurement & routing	WC	--
4.	Check cable for continuity, insulation resistance, megger values	WC	Rw
5.	Identification tags/ tag plates and proper dressing & clamping	WC	S
6.	Separation of signal/ thermocouple and power cables	WC	S
7.	Proper glands as per area classification, size of cable, JB entry, etc.	WC	S
8.	Identification/ ferrule and dressing inside junction boxes and instrument	WC	S
9.	Crimpable type lugs and proper crimping	WC	--
10.	Telephone wire connection inside JB	WC	--
11.	Shield wire dressing/ sleeving and termination	WC	--
12.	Insulation of shield wire on instrument end	WC	--
13.	Preparation of drum cutting plan	WC	--
14.	Ensure bending radius of cable is maintained	WC	S
15.	Ensure spare cores are terminated with identification	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2610

INSTALLATION OF JUNCTION BOXES, LOCAL CONTROL PANEL

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming Material Inspection	WC	Note 1
2.	Check suitability as per specified hazardous area classification	WC	Rw
3.	Check Correctness of cable entries	WC	--
4.	Alignment	WC	--
5.	Tightening of fasteners	WC	--
6.	Tightening & numbering of terminal blocks	WC	Rw
7.	Availability of telephone sockets (for JB's) & earthing point	WC	--
8.	Earthing of JB/ LCP	WC	S
9.	Plugging of spare entries with correct plugs	WC	S
10.	Wiring of various hardware in LCP as per approved wiring drawings	WC	S
11.	Protection of JB and LCP (Canopy, weather shed)	WC	S
12	Easy access from O&M point of view	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2611

FABRICATION & ERECTION OF AIR LINES AND TUBING OF PNEUMATIC LINES

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming Material Inspection	WC	Note 1
2.	Availability of AFC drawings for air / pneumatic distribution line	WC	Rw
3.	Proper packing material/ sealant used at threaded joints	WC	--
4.	Providing three piece union at each loop for easy maintenance	WC	--
5.	Slope of Air Lines, provision of drain valves at lowest point on main header / Drain & Vent assemblies, isolation valves (Ball valves)	WC	S
6.	Tightening of joints	WC	--
7.	Ensure separate cable tray for erection of pneumatic tubing	WC	S
8.	Supporting and clamping	WC	S
9.	Test air lines as per standards/ specifications and record	WC	S
10.	Check for inlet, outlet, signal, test and drain connection on the instrument	WC	S
11.	Correct supply as per data sheets	WC	--
12.	Flush Air lines before pneumatic tubing connection to instruments	WC	S
13.	Punching of ferrules	WC	--
14.	Tagging at both ends of tubes	WC	S
15.	Test pneumatic tubing as per standards/ specifications and record	WC	S
16.	Tubing as per vendor hook up drawing	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Document	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2612

INSTALLATION OF FLOAT TYPE LEVEL SWITCHES LEVEL GAUGES AND TANK LEVEL INDICATORS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming Material Inspection	WC	Note 1
2.	Check Tapings provided at vessels/stand pipes are matching with centre to centre distance on respective instruments & connection size ratings are matching with instruments.	WC	--
3.	Check tapings provided at vessels/stand pipes are matching with process requirements/P&IDs	WC	--
4.	Deployment of approved welders, usage of approved consumables & procedures, pipes & pipe fittings as per PMS	WC	--
5.	Alignment of flanges, visibility of gauges and orientation of instrument	WC	S
6.	Verticality of the instrument	WC	S
7.	Installation of float, displacer, instrument accessories as per data sheet/vendor's instruction manuals	WC	S
8.	QA/QC clearance for welding & testing	WC	W
9.	Tightness of guide wires (as applicable) for Tank Level indicators	WC	-
10.	Usage of correct size, rating & type of gasket and stud/ nuts as per PMS	WC	S
11.	Tightness of studs/ nuts	WC	S
12.	Check for requirements of Steam Tracing/ Insulation as per Process requirements	WC	Rw
13.	Check for type of Illuminators for Transparent Type Level Gauges suitable to area Classification, Cable Glanding, Termination, plugging of spare entries	WC	S
14.	Final inspection	WC	W
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

Note :1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2613

INSTALLATION OF TEST THERMOWELLS, TEMPERATURE GAUGES AND TEMPERATURE ELEMENTS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming Material Inspection	WC	Note-1
2.	Correctness of range, rating, immersion length (U length), Instrument tags as per P&ID/ Instrument data sheets	WC	Note-1
3.	Check for flange size, orientation, location as per P&ID	WC	S
4.	Usage of correct size, rating & type of gasket and stud/ nuts as per PMS	WC	S
5.	Installation of temperature element head & assemblies	WC	S
6.	Tightness of studs/ nuts	WC	-
7.	Visibility & orientation of gauges	WC	--
8.	Plugging of spare entries with correct size plugs	WC	S
9.	Check for tapping height from top of pipe as per U-length	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2614

LOOP CHECKING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Completeness of installation as per standards & specifications, completeness of FAT punch points (if any)	WC	Rw
2.	Liquidation of punch list as per ITP	WC	Rw
3.	Availability of standard calibrated equipment	WC	Rw
4.	Coordination with DCS vendor	WC	S
5.	Loop checking		
	a) From instrument to junction box	WC	--
	b) From Instrument to control room	WC	S
6.	Recalibrate/ fine tune instruments for accurate response if required	WC	--
7.	Check for inter locks and response of final control elements	WC	S
8.	Ensure proper response and record	WC	Rw
9.	Loop acceptance	WC	W
10.	Usage of proper communication equipment	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO: 2615

INSTALLATION OF IMPULSE PIPING

SL. NO	ACTIVITY	CONTR-ACTOR	EIL		
			CAT A	CAT B	CAT C
A.	**PRIOR TO FABRICATION**				
1.	Incoming Material				
	a) Documents (MRIR etc.): Review & acceptance	WC	NOTE 1	NOTE 1	NOTE 1
	b) Physical verification	WC	NOTE 1	NOTE 1	NOTE 1
2.	Welding Filler Material Approval/Qualification				
	a) Review of Manufacturer's Test Certificates/Documents & Sampling	WC*	HP*	Rw*	Rw*
	b) Laboratory Testing, if any	WC	W	Rw	Rw
3.	WPS/PQR				
	a) Review of proposed procedure	WC	HP	Rw	Rw
	b) Welding of Test Coupon and subsequent testing	WC	W	Rw	Rw
	c) Approval of final WPS/PQR	WC	HP	Rw	Rw
4.	a) Welder performance Qualification	WC	W	Rw	--
	b) Certification & approval of welders	WC	HP	Rw	--
5.	NDT Procedure Qualification				
	i) Review of proposed procedure	WC	HP	Rw	--
	ii) Witnessing of Proposed Procedure Testing	WC	W	Rw	--
	iii) Approval of Qualified Procedure	WC	HP	Rw	--
6.	Review of Joint numbering Procedure, numbering in Isometrics (Big & Small bore)/ Sketches	WC	W	Rw	--
7.	Material traceability & Transfer of Heat Nos. (Material Traceability not required for utility services)	WC	W	S	--

* Notwithstanding any other tests/documentation required for qualification/approval of filler metals :

i) For Alloy Steel & Stainless Steel welding filler metals, chemical analysis to be carried out for every batch.

ii) For low temp. services piping and for material class wherever impact requirement is specified in WSC, Impact testing to be carried out for every batch of the filler metal, to be witnessed by Owner/ EIL.

For NACE filler metals, corrosion tests like HIC, SSCC, etc. to be carried out for every batch. However, HIC/SSCC tests done earlier & duly witnessed by a reputed third party, will be acceptable.

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ITP NO: 2615

INSTALLATION OF IMPULSE PIPING

SL. NO.	ACTIVITY	CONTR-ACTOR	EIL		
			CAT A	CATB	CATC
B.	**FABRICATION (SHOP & FIELD)**				
1.	Material as per piping class (check w.r.t. approved colour coding procedure), Fit-up check and Traceability check	WC	S	--	--
2.	Pre-heat (if any)	WC	S	--	--
3.	Certificate of purity of purging/shielding Gas (if any)	WC	Rw	--	--
4.	Purging rate (if any) and arrangement	WC	Rw	--	--
5.	Shielding rate (if any)	WC	Rw	--	--
6.	Baking of Electrodes	WC	S	--	--
7.	Inter-pass cleaning & Temperature check	WC	S	--	--
8.	Visual Examination of completed welds	WC	W	S	--
9.	a) Monitoring of PWHT Cycle	WC	S	--	--
	b) Review of Time – Temperature graph	WC	Rw	Rw	Rw
	c) Hardness Check	WC	S	--	--
10.	PT/MT	WC	W	S	--
11.	Identification of Joints for Radiography (for Random Radiography only)	WC	Rw	--	--
12.	Review of Radiographs interpreted by the Contractor	WC	HP	W	Rw

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ITP NO: 2615

INSTALLATION OF IMPULSE PIPING

SL. NO.	ACTIVITY	CONTRA-CTOR	EIL		
			CATA	CAT B	CATC
C.	**Installation**				
1	Check for tapping size, orientation, location as per P&ID	WC	**S**	**S**	S
2	Check for Meter below / above installation as per Process / P&ID requirement	WC	**S**	**S**	S
3	Check for high-low connections of DP type Instruments as per P&ID	WC	RW	RW	--
4	Check for Fit-up & flow direction of Globe Valve in line with respective Installation Standard	WC	RW	RW	--
5	Ensure NDT clearance & availability of complete LHS	WC	HP	HP	Rw
6	Ensure Impulse Piping Steam Tracing/ Electrical Tracing (as applicable)	WC	S	S	Rw
7	Hydro-testing of Impulse piping as per standards / specifications and record	WC	W	W	Rw
D.	**PROOF TESTING (See enclosed checklist as per format I-01)**				
1.	Availability of approved installation standards	WC	Rw	Rw	Rw
2.	Procedure Review	WC	HP	Rw	Rw
3.	Preparation of Punch list	WC	S	S	--
4.	Liquidation of check list, if applicable	WC	HP	W	--
5.	Correctness of Testing arrangements	WC	S	--	--
6.	Scrutiny of History Sheets for Mechanical & NDT Clearance	WC	HP	W	Rw
7.	Positive Material Identification as per specification after completion of installation	WC	S	Rw	--
8.	a) Availability of Valid Calibration certificates of pressure Gauges	WC	Rw	Rw	Rw
	b) Field Calibration, if any	WC	S	--	--
9.	Air/Water Flushing (preliminary)	WC	-	--	--
10.	Pressure Testing (Pneumatic/ Hydrostatic testing),Visual inspection of all weld joints for leak during Pneumatic/ Hydrostatic testing **(See Format I – 02)**	WC	HP	W	--
11.	Draining of Water & Air Drying	WC	S	--	--

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ITP NO: 2615

INSTALLATION OF IMPULSE PIPING

SL. NO.	ACTIVITY	CONTRA-CTOR	EIL		
			CAT A	CATB	CATC
13.	Boxing up including reinstallation of flappers of check valves	WC	S	--	--
14.	Review of Records of fasteners & gaskets	WC	Rw	Rw	Rw
15.	Torque tightening/ tensioning of flange joints, wherever applicable	WC	S	--	--
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.

2) Pre-commissioning activities such as chemical cleaning, card board blasting, system testing are not covered by these ITP's. The Contractor shall develop ITP's for such activities and obtain Owner/ EIL/ Licensor's approval.

CAT A : All services involving hydrogen and hydrogen containing fluids, All piping of 600# rating & above ,All SS, AS, NACE, LTCS impulse piping

CAT B : All CS impulse piping for process lines up to 600 #

CAT C : Piping for "D" class fluid (Utility lines), Non IBR portion of condensate & steam lines.

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ITP NO: 2631

INSPECTION & PANEL ERECTION - CONTROL ROOM

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Receipt of materials/ panels as per purchase requisition, inspection release note, bill of materials, etc.	WC	Note 1
2.	Storage of materials at site	WC	S
3.	Shifting of panels into the control room without damage	WC	--
4.	Check for Hole to hole dimensions of the base frames with the as built drawings of the panels	WC	--
5.	Check alignment, fastening, welding & painting of the base frame.	WC	S
6.	Erection of panels as per approved layout drawing, after completion of all welding works	WC	S
7.	Tagging/identification of panels	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2632

FABRICATION & ERECTIONOF CABLE TRAYS - CONTROL ROOM

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Availability of latest revision of approved tray layout drawings	WC	Rw
2.	Welding & painting of supports before erection of panels	WC	--
3.	Fastening and joining of cable trays	WC	--
4.	Removal of sharp edges	WC	--
5.	Covering of cable trays for unarmored and system cable trays	WC	S
6.	Separate cable trays for power and signal cables with sufficient distance apart	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO: 2633

LAYING, GLANDING & TERMINATION OF INTERCONNECTION CABLES, PREFABRICATED CABLES, SYSTEM CABLES, POWER CABLES AND FIELD CABLES – CONTROL ROOM

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Correct size & type of cables as per cable schedule	WC	Note 1
2.	Testing of cable before laying as per specification (continuity, megger, etc.), as applicable	WC	--
3.	Check for exact distance and cables cutting accordingly	WC	--
4.	Tag on cables as per specification	WC	S
5.	Availability of proper cable gland size, type of specified thread	WC	--
6.	Tightening of check nut (after termination)	WC	--
7.	Cable continuity & insulation resistance, as applicable	WC	Rw
8.	Dressing of cables inside PVC Duct and covering of PVC Duct after complete cabling.	WC	S
9.	Termination of shield wire with green sleev into earth bus bar	WC	S
10.	Ferruling of cables	WC	S
11.	Usage of sleeved crimpable type lugs	WC	--
12.	Crimping of lugs	WC	--
13.	Tightness of cables in the terminal block	WC	--
14.	Numbering of terminal blocks	WC	--
15.	Continuity of fuses in terminal blocks	WC	--
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

Note : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO: 2634

POWER 'ON' OF PANELS AND PRE-COMMISSIONING OF THE SYSTEM - CONTROL ROOM

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Check for earth pit resistance	WC	Rw
2.	Earth connection to system earth, panel earth etc.	WC	S
3.	Ensure proper interconnectivity of panel earth bus	WC	S
4.	Incoming power supply and termination of the power cables	WC	S
5.	Check for compliance of FAT Punch Points (if any)	WC	Rw
6.	Power 'ON' the system and observe system booting and self diagnostic check.	WC	W
7.	Reload the software's, if necessary	WC	S
8.	Check for alarms by switching 'ON'/'OFF' the sub systems	WC	S
9.	Start simulation of individual loops from respective 'Field Terminal Blocks' (FTBs)	WC	S
10.	Observe the response and tune the controllers	WC	S
11.	Interlocks as per P&ID	WC	S
12.	Record the input & outputs	WC	Rw
13.	Trend reports, logging reports/shift reports & alarm, sequence and functioning of all peripheral units.	WC	Rw
14.	Back-up operation of PLC cards, system memory & power supply switch over	WC	W
15.	Lighting and ventilation fan operation	WC	S
16.	Functioning of complex loops	WC	W
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO: 2635

FOR FIELD LOOP CHECKING AND 'SYSTEM ACCEPTANCE TEST' - CONTROL ROOM

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Coordination with field contractor for loop checking.	WC	S
2.	Operation of sub systems and peripheral systems	WC	S
3.	'Back-up' system operations	WC	S
4.	Ensure feedback/commands from/to electrical system	WC	S
5.	System acceptance	WC	HP
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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FORMAT NO: I -01
(Sheet 1 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE - IMPULSE PIPING

Project : _____	Report No : _____
Plant/Unit : _____	Date : _____
Contractor : _____	Area : _____
Instrument Tag No.: _____	Installation Standard No. : _____

Line No (Isometric No.)	Rev.	GAD No.	Rev.	P&ID No.	Rev.

	Items to be checked		Accept Contractor	Remarks
1.	**Installation checked as per Installation Standard**			
2.	Installation checked as per P&ID			
3.	Installation completed for **(enclosed)**			
	a. Joint Numbering (Shop & Field Welds)			
4.	**Valves** (Check Rating, Gaskets, Flow Direction, Sheet No., Tag No., Damage, etc.)	Nos.		

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FORMAT NO: I -01
(Sheet 2 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE - IMPULSE PIPING

	Items to be checked	**Accept**	**Remarks**
		Contractor	
5.	**Flanged Joints :**		
	Total Nos.		
	Check for type of flange		
	Check for Rating		
	Check for Alignment, (proper gap & parallelity)		
	Check for Correct Studs & nuts – dia., length, Material, uniform protrusion of studs, anti seize compound		
	Check for correct gasket (type, size, spec., thickness, etc.)		
	Torque values used for tightening		
6.	Seal Welding of Screwed Connections (if Required)		
7.	Vents/Drains as per Standard		
8.	**Orifice Flanges :**		
	Check for Tag No., tapping orientation, tap valve, jack screw, straight run length of upstream & downstream		
9.	**Local Gauges :** Check for accessibility		
10.	Supports as per drg. and specifications		

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FORMAT NO: I -01
(Sheet 3 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE - IMPULSE PIPING

	Items to be checked	Accept	Remarks
		Contractor	
11.	**Vents/ Drains :**		
	- As per drg.		
	- Orientation of valve handles		
12.	**Joists History sheets enclosed for :**		
12.1	Material Traceability as per Procedure No:_____ (refer enclosed suggested Format)		
12.2	Fit ups checked		
12.3	NDT Complete (Radiography, MT, PT)		
12.4	Stress Relieving & Hardness check complete		
12.5	Positive Material Identification **(PMI)**		
13.	Supports and Weld/ Flanged/ Screwed connections free from insulation or other coverage		

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FORMAT NO: I -01
(Sheet 4 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE - IMPULSE PIPING

	Items to be checked	Accept	Remarks
		Contractor	
14.	**Physical-Walk-Through-The-Line,** checked for gross irregularities including physical damages, unwanted tacks, arc strikes, spatters		
Other :			
Remarks			
Reviewed by Contractor (one level higher than checker)			
Name :	Designation :		
Date :			
EIL			
Sign :			
Date :			
Name :	Designation :		

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FORMAT NO: I -02

RECORD FOR HYDRO TEST– IMPULSE PIPING

Project : _____	Report No : _____
Plan : _____	Date : _____
Contractor : _____	Area : _____
Instrument Tag No. : _____	REF P & ID No. : _____
	Installation Standard No. : _____

Test Medium :		Test Duration :	Design/Test Pressure :
Test Pressure Gauge No.	Range	Calibration Certificate No.:	Gauge Calibration Date:

Items to check		Accept	Witness	
		Contractor	EIL	
	Field Installation Checklist Prior to Hydrotest Signed			
	Punch list Prepared	Yes ☐ No ☐		
	Pre-hydrotest punch items cleared			
	Accessibility to Inspection/Witness Locations			
	Capacity of pressurizing pump checked			
	Cordon off area for high pressure testing, as required			
	Pre-hydrotest flushing carried out			
	Statutory Authorities/Others test Witnessing Required	Yes	No	

Released for Pressure Testing :

Contractor :	**EIL:**
Sign : Name :	Sign : Name :
Date :	Date :
Designation :	Designation:

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FORMAT NO: I -03

RECORD FOR HYDRO TEST– IMPULSE PIPING
INSTRUMENT TAG NO.

ACTIVITY	Date	Time
Water Filling and Venting Done		
Water Filling Completed		
Vents Closed		
Isolation of Pressurizing pump		
Test completed at :		
- Water drained		
- Test Result	☐ Acceptable	☐ Not Acceptable

Contractor :	**EIL:**
Sign :	Sign:
Date :	Date:
Name : Designation	Name: Designation:

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सिविल, सरंचना एवं वास्तुकला कार्यों (ईपीसीसी/ एकमुश्त टर्नकी संविदाओं) के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP) CIVIL, STRUCTURAL & ARCHITECTURAL WORKS (EPCC/LSTK CONTRACTS)

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by: StandardsCommitteeConvenor	Approved by: Standards Bureau Chairman
4	29.08.2023	REVISED AND REISSUED	DJ	DG	RKS	SM
3	27.07.2018	REVISED AND REISSUED	SKG	AP	AKK	RKT
2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	17.10.2005	ISSUED AS STANDARD SPECIFICATION	MPJ	SPS	VNP	VJN

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Abbreviations:

AFC	:	Approved For Construction
BM	:	Bench Mark
CI	:	Cast Iron
CPT	:	Cone Penetration Test
GI	:	Galvanized Iron
IRC	:	Indian Road Congress
JB	:	Junction Box
MS	:	Mild Steel
MT	:	Magnetic Particle Testing
NDT	:	Non Destructive Testing
PCC	:	Plain Cement Concrete
PQR	:	Procedure Qualification Record
PT	:	Penetration Testing
PVC	:	Poly Vinyl Chloride
PWHT	:	Post Weld Heat Treatment
RCC	:	Reinforced Cement Concrete
RF	:	Reinforcement
SPT	:	Standard Penetration Test
U/G	:	Under Ground
WBM	:	Water Bound Macadam
WMM	:	Water Mix Macadam
WPS	:	Welding Procedure Specification

Construction Standards Committee

Convenor: Sh. Rupesh Kumar Singh , ED (Construction)

Members: Sh. Janak Kishore, ED (Projects),
Sh. Chinmoy Kapuria, CGM (SCM),
Sh. Udayan Chakravarty, Sr. GM (Piping),
Sh. Debasish Ghosal, GM (Construction),
Sh. Pankaj Kumar Rai, DGM (Construction),

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GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : **Hold Point;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : **Witness Point;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw : **Review** of Contractor's documentation.

S : **Surveillance** Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records.

WC : **100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages

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ITP NO. : 2701

LAND & TOPOGRAPHICAL SURVEY

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Boundary markings and submission of drgs./sketches	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Establishing permanent bench marks, temporary bench marks with ref. to Survey of India B.Ms. by check levels	WC	HP
4.	Block levels, contour plans and submission of relevant drgs. & records.	WC	S
5.	Protection of control points, permanent bench marks and regular rechecking	WC	S
6.	Submission of Master plan showing monuments, structures exposed rocks, weirs, water works, ponds, underground services if crossing that area, etc.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO. : 2702

SOIL INVESTIGATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Positioning of test location	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Boring & sampling	WC	S
4.	In-situ testing (SPT, CPT, Plate load test, Soil Resistivity, Block vibration test, etc.)	WC	S
5.	Lab testing (as applicable)	WC	S/Rw
6.	Monitoring of water level	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO. : 2703

SITE GRADING

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearing and stripping of soil including disposal of unsuitable material	WC	S	-
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw
	b) Field calibration, if any	WC	S	-
3.	Taking and plotting of initial levels at specified intervals for cutting as well as filling areas	WC	S*	S*
4.	Classification (Levels of strata) and testing of filling soil for suitability including preparation of Lead Charts to filling/disposal areas.	WC	S	-
5.	Proper warning of explosions, misfires and storage of explosive materials (As applicable).	WC	-	--
6.	Breaking up of clods, lumps, etc. at the time of filling and compaction.	WC	S	-
7.	Identification and suitability of borrow areas for filling soil/murrum including verification of payments for royalty, etc.	WC	Rw	-
8.	Compaction test for earth filling in specified layers including finished areas.	WC	Rw	-
9.	Verification of final finished grade levels.	WC	S*	S*
10.	Computation of Earth works.	WC	Rw*	Rw*
11.	Record of tree cuttings, stacking of blasted rocks and other quarry materials including handing over to Owner	WC	S	S
12.	Preparation of "As built drawings	WC	Rw	Rw
13.	Removal of Unserviceable Surplus earth/excavated material and leveling in disposal areas.	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B: All fillings
CAT C: All cuttings.

* In case quantum of earthwork is required to be certified by EIL then W.

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ITP NO. : 2704

EXCAVATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	-
2.	Layout checking	WC	S	-	-
3.	Taking initial levels	WC	S	-	-
4.	Slopes of excavation, benching, overburden, shoring & strutting (in case of deep excavation)	WC	S	--	-
5.	Check for sub-soil water, dewatering requirements as per specifications.	WC	S	--	--
6.	Bottom level of excavation and compaction	WC	S	--	--
7.	Stacking of different type of soils separately	WC	S	-	-
8.	Making trial pits manually to check UG utilities before carrying out Mechanical excavation (if applicable).	WC	S	S	S
9.	List of obstacles encountered (cables, pipes, conduits, etc)	WC	S	S	-
10.	Barricading of excavated pits for safety & protection from rain	WC	S	S	S
	FOR HARD ROCK				
1	Obtaining license from district authorities for undertaking blasting operations	WC	Rw	Rw	Rw
2	Storing of explosive materials as per explosive rules	WC	--	--	--
3	Prominent display of red flags around the area to be blasted	WC	S	S	S
4	Check the dimensions of bore holes	WC	--	--	--
5	Stacking of hard rock for useable/non useable including handing over to owner	WC	S	S	S
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A : Equipment foundations, Plant buildings, Technological structure, etc.
CAT B : Non Plant buildings, pipe racks, pipe culverts, bridges, etc.
CAT C : Boundary walls, wing walls, manholes, drains, isolated non-critical foundations etc.

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ITP NO. : 2705

BACK FILLING

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Selection of materials/selected earth	WC	S	S	S
2.	Check for treatment of soil, if any	WC	S	S	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	-
4.	Filling in specified layers, consolidating, watering.	WC	S	-	-
5.	Compaction tests for layers	WC	Rw	Rw	Rw
6.	Filling to required levels	WC	S	-	-
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A: Equipment foundations, Plant buildings, Technological structure, etc.
CAT B: Non Plant buildings, pipe racks, pipe culverts, bridges, etc.
CAT C: Boundary walls, wing walls, manholes, drains, etc

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ITP NO. : 2706

UNDERGROUND PIPING (RCC/ CI/HDPE/UPVC/CPVC)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Checking of material	WC	NOTE 1	NOTE 1
2.	Adequate slope, benching in excavation for safety purposes (if required)	WC	S	
3.	Layout, line & level	WC	S	-
4.	Laying & jointing, grouting at manholes/chambers	WC	S	-
5.	Check for supports/ firm bed/ sub soil water level	WC	S	-
6.	Testing for leakages by blocking pipe ends	WC	W	W
7.	Hydro-testing and other tests, Removal of blockages, Cleaning & flushing of system	WC	W	W
8.	Backfilling in layers	WC	Rw	Rw
9.	Check for MS rungs in proper position, inlet/outlet pipe levels in manholes	WC	S	--
10.	Preparation of "As-built drawings"	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main Plant Buildings, Utilities, Offsites etc.
CAT C: Non Plant Buildings, Technological Buildings, Admn. Buildings, Gate House, Security Rooms, etc.

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ITP NO. : 2707 A

WBM ROADS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw
	b) Field calibration, if any	WC	S	-
2.	Layout checking including Road crossings and taking initial levels	WC	S	S
3.	Approval of source & checking/testing of materials (wherever required)	WC	NOTE 1	NOTE 1
4.	Filling (if any), compaction, providing cambers in sub-base including levels	WC	S	S
5.	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material	WC	-	-
6.	Check for camber, superelevation and levels over metalling	WC	S	S
7.	Spreading murrum/ sand, watering and rolling	WC	S	-
8.	Checking thickness after each layer and rectification thereof (if any)	WC	S	S
9.	Checking quantity of aggregate by excavation of trial pits as per IRC Code	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Roads subjected to heavy loading, connected to main highway, main plant roads
CAT C: Balance Roads

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ITP no: **2707 B**

WMM for Roads

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a.) Review of calibration certificates of instruments/testing equipment's.	WC	Rw	Rw
	b)Field calibration, if any.	WC	S	-
2.	Design Mix to fix the proportion of ingredients	WC	Rw/HP	Rw/HP
3.	Layout Checking including Road Crossing & taking initial levels.	WC	S	S
4.	Approval of source & checking /testing of materials (wherever required)	WC	Rw	Rw
5.	Filling (if any), compaction, providing chambers in sub-base including levels.	WC	S	-
6	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material.	WC	S	-
7	Check for camber, superelevation & levels.	WC	S	S
8	Spreading, watering & rolling.	WC	S	-
9	Checking thickness after each layer and rectification thereof (if any).	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT- A –Roads subjected to heavy loading connected to main High way, main plant roads etc.

CAT B- Balance roads

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ITP NO. : 2708

BLACK TOPPING- PREMIX CARPETING - PC, BITUMINOUS CONCRETE (BC) & BITUMINOUS MACADAM (BM)/ DENSE BITUMINOUS MACADAM (DBM)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Note 1
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Surface preparation & check for camber/level	WC	S
4.	Checking/ testing of material wherever required	WC	S
5.	Tack coat application	WC	-
6.	Laying of Premix carpeting/ BC/BM/DBM including rolling	WC	S
7.	Application of Seal coat	WC	-
8.	Check for camber, superelevation and levels	WC	S
9.	Check for bitumen temperature and consumption	WC	S
10.	Thickness check of Premix carpet/ BC/BM/DBM	WC	S
11.	Removal of surplus earth	WC	-
12.	Berm preparation	WC	-
13.	Final Inspection	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO. : 2709

TANK PADS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CAT B
1.	Approval of source of materials	WC	NOTE 1	NOTE 1
2.	Stripping the area	WC	-	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	RW
	b) Field calibration, if any	WC	S	S
4.	Layout and marking of ground level	WC	S	-
5.	Excavation to required level, compaction of sub-base	WC	S	S
6.	Checking/ testing of materials	WC	S	S
7.	Filling selected materials in specified layers, rolling, watering	WC	S	-
8.	Compaction tests	WC	Rw	Rw
9.	Gravel filling under annular ring with compaction and adding graded filler material (As applicable)	WC	S	S
10.	Anti-corrosive layer, consolidation	WC	S	-
11.	Premix carpeting on side slopes	WC	S	S
12.	Preparation of "As-built drawing" for erection	WC	Rw	Rw
13.	Check for settlement of pads during hydro testing of tanks	WC	W	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: All Site fabricated steel storage tanks for process fluid/ Hydrocarbon, floating roof, tanks having capacity 600cum or 10m dia. and 8 m height.

CAT B: Site fabricated steel storage tanks for Raw water, Fire water, waste water, DM water, etc. and all tanks not covered under "CAT A".

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ITP NO. : 2710

MICRO GRADING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW
	b) Field calibration, if any	WC	-
2.	Taking initial levels	WC	S/Rw
3.	Clearing/ Removal of extra soil, debris, etc. from site by transportation	WC	-
4.	Taking final levels	WC	S
5.	Verification of gradient of ground	WC	S
6.	Finishing of ground surface by hand compactor/ Roller (As applicable)	WC	S
7.	Final inspection	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
A.	**PRIOR TO FABRICATION**			
1	Incoming materials	WC	NOTE 1	NOTE 1
2.	Welding Filler Material Approval/Qualification			
	i) Review of Manufacturer's Test Certificates/ other documents	WC	RW	RW
	ii) Testing, if any	WC	Rw	Rw
3.	WPS/PQR			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Welding of test coupon and subsequent Testing, if applicable	WC	W	W
	iii) Approval of Final WPS/PQR	WC	HP	HP
4	Certification & approval of welders	WC	Rw	Rw
5.	NDT Procedure Qualification			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Testing	WC	Rw	Rw
	iii) Approval of NDT procedure	WC	HP	HP
6.	Preparation of sketches from General Arrangement drawings	WC	Rw	-
7.	Joint numbering	WC	Rw	-
8.	Approval of colour coding scheme	WC	Rw	-
9.	Monitoring of colour coding on pipes & fittings	WC	S	-
B.	**FABRICATION (SHOP & FIELD)**			
1.	Material as per piping class (check w.r.t. approved colour coding procedure)	WC	S	
	i) Fit-up check ii) Dimensional check	WC WC	S S	Rw Rw

NOTE : 1) For incoming material inspection please refer ITP no: -6-82-1010.

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

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ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
2.	Pre-heat (if any)	WC	S	-
3.	Check for purity of purging/shielding Gas (if any)	WC	S	-
4.	Purging (if any)	WC	S	-
5.	Shielding rate (if any)	WC	S	-
6.	Baking of Electrodes	WC	S	-
7.	Inter-pass cleaning & Temperature check.	WC	S	-
8.	Visual check of completed welds	WC	S	-
9.	PT/MT	WC	S	-
10.	Radiography marking (for Random Radiography)	WC	S	S
11.	Radiography Interpretation	WC	Rw	Rw
C.	**HYDROSTATIC/ PNEUMATIC TESTING**			
1.	Procedure Review	WC	Rw	Rw
2.	Correctness of Testing arrangements	WC	S	-
3.	Calibration of Pressure Gauges	WC	-	-
4.	R.F. Pad testing, if any	WC	S	-
5.	Scrutiny of test packs for Mechanical & NDT Clearance (Refer UG-01)	WC	HP	HP
6.	Air/Water Flushing (preliminary)	WC	S	S
6a.	Addition of corrosion inhibitors, if required – Approval of make & quality	WC	S	S

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

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ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
7.	Pneumatic/ Hydrostatic testing	WC	S	S
8.	Draining of water & Air drying	WC	S	S
D.	**LAYING**			
1.	Trench excavation and levels	WC	S	-
2.	Cleaning of pipe surface	WC	S	-
3	Approval of wrapping/coating material manufacturers	WC	Note 1	Note 1
4.	Approval of agency for wrapping & coating	WC	Rw	Rw
5.	Sample test of coating materials in approved laboratory	WC	Rw	Rw
6.	Application of primer	WC	S	S
7.	Coal tar temperature	WC	S	-
8.	Coating & wrapping	WC	S	S
9.	Approval of agency for epoxy coating/ cold tape joint/ hot jointing method	WC	Rw	Rw
10.	Check Thickness of coating (if applicable)	WC	S	-
11.	Calibration of Holiday tester	WC	Rw	Rw
12.	Holiday testing	WC	W	S
13.	Peel test	WC	S	S

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

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ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
14.	Lifting arrangement	WC	S	-
15.	Lowering (levels & orientation of branches)	WC	S	-
16.	Checking of wrapping & coating for damages during lowering, their repair, Holiday Testing, etc.	WC	S	S
17.	Back filling & compaction	WC	S	-
18.	Location, Brickwork, plaster of valve pit	WC	-	-
19.	Top cover & Finish of valve pit	WC	S	S
E.	**SYSTEM COMPLETION**			
1.	Tie in joints	WC	Refer 2740A	Refer 2740A
2.	Scrutiny of test packs for system testing	WC	Refer 2740B	Refer 2740B
3.	System testing	WC	W	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

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ITP NO. : 2740A

TIE IN JOINTS FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
A.	Fit up	WC	S
B.	Root Run DP	WC	S
C.	Final Run DP	WC	S
D.	Radiograph Review	WC	Rw
E.	PWHT Hardness	WC	Rw
F.	RF Pad Testing	WC	W
G.	Cleaning & Priming	WC	S
H.	Coating, Wrapping	WC	S
I.	Peel Test	WC	S
J.	Holiday Testing	WC	W
K.	Checking For Any Damage In Wrapping & Coating After Lowering, Their Repair Holiday Testing, Etc.	WC	S
L	Back Filling	WC	S

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ITP NO. : 2740B

MECHANICAL COMPLETION RECORD FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearance for flushing & testing	WC	Rw	Rw
1a.	Mechanical clearance			
	- Conformity with drawing	WC	Rw	Rw
	- Material as per Specification	WC	Rw	Rw
1b.	Welding & NDT clearance			
	- Material as per Specification	WC	Rw	Rw
	- Fit-up check record	WC	Rw	Rw
	- Visual check of completed welds	WC	Rw	-
	- PT/MT	WC	Rw	Rw
	- Radiography	WC	Rw	Rw
	- PWHT & hardness	WC	Rw	Rw
	- RF pad testing	WC	Rw	Rw
2.	Flushing & Pressure testing	WC	W	W
3.	Coating & wrapping			
	- Surface preparation	WC	Rw	-
	- Primer application	WC	Rw	Rw
	- Coating, wrapping & peel test	WC	Rw	-
	- Holiday check	WC	Rw	Rw
4.	Laying			
	- Trench leveling	WC	Rw	Rw
	- Lowering & checking for damages in wrapping & coating, their repair, Holiday testing, etc.	WC	Rw	Rw
	- Backfilling	WC	Rw	Rw

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance works

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ITP NO : 2741

PLAIN CEMENT CONCRETE

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	S	Rw
2.	Checking of layout and materials, compaction of sub –grade	WC	S	-
3.	Mix proportion	WC	S	-
4.	Check for shuttering, dewatering if any.	WC	-	-
5.	Concreting with proper compaction	WC	-	-
6.	Checking of top level of PCC	WC	Rw	-
7.	Curing	WC	-	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B : for filled-up area
CAT C : for cutting area

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ITP NO : 2742

REINFORCED CEMENT CONCRETE (SUBSTRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	S
3.	Checking of layout & condition of PCC/ leveling course	WC	S	S	-
4.	Incoming material checking	WC	NOTE 1	NOTE 1	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering including its condition, quality and rigidity.	WC	S	--	-
7.	Check for sub-soil water & dewatering arrangement, if any	WC	S	--	-
8.	Reinforcement & covers to reinforcement	WC	S	S	--
9.	Inserts, Anchor bolts and pipe sleeves, pockets, dowels, etc.	WC	S	S	--
10.	Pour Card	WC	W	S	Rw
11.	Check for obstacles encountered (Electrical conduits, pipe lines, etc.)	WC	S	--	-
12.	Concreting, testing, compaction & finishing	WC	S	S	-
13.	Casting of cubes	WC	S	S	--
14.	Curing	WC	S	S	-
15.	Testing of cubes – 7 days	WC	S/Rw	S/Rw	S/Rw
16	Testing of cubes – 28 days	WC	W	S/Rw	S/Rw
17.	Removal of shuttering	WC	S	-	-
18.	Check for water tightness, rendering, if any	WC	S	S	S
19.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour ,etc.

CAT B: Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc

CAT C: Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

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ITP NO : 2743

REINFORCED CEMENT CONCRETE (SUPER STRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CATA	CATB	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	S
3.	Checking of layout	WC	S	--	-
4.	Incoming material inspection	WC	Note 1	Note 1	Note 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering and scaffolding/ vertical bracing including hoisting arrangements.	WC	S	S	-
7.	Reinforcement & covers to reinforcement	WC	S	S	--
8.	Inserts, bolts, pipe sleeves, MS rungs, concealed electrical conduits, fan hooks, dowels, etc. including welding if any	WC	S	S	-
9.	Pockets/ openings	WC	S	S	-
10.	Expansion joints, if any	WC	S	S	-
11.	Check for water stops, slopes, stoppers, if any	WC	S	S	-
12.	Pour Card	WC	W	S	Rw
13.	Concreting, testing, compaction & finishing	WC	S	S	S
14.	Casting of cubes	WC	S	S	S
15.	Curing	WC	S	S	-
16.	Testing of cubes – 7 days	WC	S/Rw	S/Rw	S/Rw
17	Testing of Cubes – 28 days	WC	W	Rw	S/Rw
18.	Removal of formwork/ staging	WC	S	-	-
19.	Verification of dimensions viz. AFC drawings and tolerances	WC	S	S	S
20.	Check for water tightness, rendering, if any	WC	S	S	-
21.	Preparation of As built drawings.	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Super structure of foundations for Critical equipment's i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and super structure of any other foundation with RCC Quantity > 250 Cum. in single pour, Slabs of plant and non-plant buildings, etc.

CAT B: Unit Pipe racks, plant buildings and super structure of other equipment not covered in category A, etc

CAT C: Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

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ITP NO : 2745

RCC PAVEMENT/FLOORING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Layout checking/ excavation of all new foundations	WC	-
4.	Incoming material inspection	WC	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP
6.	Check for proper back filling/compaction/ completion of sub - Structure works	WC	S
7.	Check for edges of shuttering, alternate panels	WC	-
8.	Check for slopes, thickness of flooring	WC	S
9.	Shuttering, reinforcement (as applicable)	WC	-
10.	Check for expansion joints/ Construction joints	WC	S
11.	Check for concealed pipe embedment, earthing, if any	WC	-
12.	Check for dividing strips, as applicable	WC	S
13.	Concreting, finishing, etc	WC	S
14.	Checking for line, levels, slopes, joints, thickness of flooring viz. AFC drawings	WC	S
15.	Curing	WC	S
16.	Grinding & polishing, as applicable	WC	S
17.	Testing of concrete cubes -7 days (as applicable)	WC	S/Rw
18	Testing of concrete cubes -28 days (as applicable)	WC	W
19.	Preparation of "As Built Drawings"	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO : 2746

BRICK MASONARY

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	Rw	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Cleaning of surface	WC	-	-
4.	Wetting/soaking of bricks	WC	S	S
5.	Cement mortar proportion	WC	S	S
6.	Staging & scaffolding	WC	-	-
7.	Hacking of adjacent concrete surface	WC	S	S
8.	Check for bond/closers, thickness of joints	WC	S	-
9.	Line, level & plumb	WC	S	S
10.	Raking out joints, keys in brick work, if any	WC	S	S
11.	Check for placement of Reinforcement bars in case of partition brick work	WC	S	S
12.	Embedment of fixtures	WC	S	S
13.	Curing	WC	-	-
14.	Preparation of 'As Built' Drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B : Load bearing walls
CAT C : Balance works

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ITP NO : 2747

STRUCTURAL STEEL WORKS

S. NO	ACTIVITY	CONTRA-CTOR	EIL		
			CAT A	CAT B	CAT C
A	**PRE – FABRICATION ACTIVITIES**				
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	
2.	Incoming material inspection	WC	Note 1	Note 1	Note 1
3.	Welding Filler material approval/ qualification				
	a) Manufacturing test certificates/ documents	WC	Rw	Rw	Rw
	b) Testing, if any	WC	S	S	S
4.	Approval of WPS/ PQR	WC	HP	HP	HP
5.	Welders performance qualification	WC	Rw	Rw	Rw
6.	Layout checking	WC	S	-	-
7.	Welding equipment and accessories	WC	S	-	-
8.	Preparation and approval of Fabrication drawings	WC	Rw	Rw	-
B	**FABRICATION ACTIVITIES**				
1.	Materials as per design drawing	WC	Rw	Rw	Rw
2.	Check straightness and non-warping of members	WC	S	S	-
3.	Dimensional and fit-up checks including provision of slopes for deflection wherever required	WC	S	S	-
4.	Visual check for welding	WC	S	S	-
5.	Grinding including surface preparation for painting and application of primer	WC	S	S	-
6.	Checking paint as per specs, shelf-life, etc.	WC	S	S	-
7.	Application of specified paint, painting thickness, etc.	WC	S	S	-
C	**FIELD ERECTION ACTIVITIES**				
1.	Lifting arrangements including test certificates of lifting tackles	WC	S	S	Rw
2.	Correctness of location	WC	S	-	-
3.	Orientation of bracing, lugs, Anchor bolts	WC	S	-	-
4.	Alignment & levels	WC	S	-	-
5.	Field welding (if any)	WC	S	S	-
6.	Grouting	WC	S	S	-
7.	Finishing coat of paint, thickness of paint etc.	WC	S	S	S
8.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Steel structures pertaining to equipments i.e. compressors, reactors, columns, stacks, Technological structures.

CAT B: Steel structures pertaining to Unit Pipe racks, and other equipments not covered in category A, etc.

CAT C: Steel structures of Non critical pipe racks (branch pipe, offsite pipe rack, etc) plant buildings and non-plant buildings, pipe sleepers, manhole, catch pit, walkways, platforms at grade levels, etc.

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ITP NO : 2748

PILING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Approval of source of materials	WC	HP	HP	Rw
2.	Layout and ground level	WC	S	S	-
3.	Incoming material inspection	WC	Note 1	Note 1	Note 1
4.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
5.	Driving of piles & check for set point	WC	S	S	-
6.	Check for depth of bore and lowering of cage measuring	WC	S	-	-
7.	Pour Card	WC	HP	S/Rw	Rw
8.	Concreting,	WC	W	S	S
9.	Casting of cubes/Testing – 7 days	WC	S/Rw	S/Rw	S/Rw
10.	Casting of cubes/Testing – 28 days	WC	W	S/Rw	S
11.	Check for cut off level of concreting & quantity of concrete poured	WC	S	-	-
12.	Lifting of casing pipe	WC	S	--	-
13.	Pile load tests (lateral/vertical/cyclic/pull out)	WC	W	Rw	Rw
14.	Submission of pile load test report	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour ,Technological structures, etc.

CAT B: Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc.

CAT C: Non critical pipe racks(branch pipe, offsite pipe rack, etc.) non-plant buildings ,pipe sleepers, manhole, catch pit, etc.

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ITP NO : 2771

ANTI-TERMITE TREATMENT

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of applicator agency	WC	HP
2.	Incoming material inspection & spraying devices including personal protective equipments like facemask, gloves, shoes, etc.	WC	Note 1
3.	Preparation of surface for taking dosage of emulsion by ramming of each layer of soil by roding the earth at specified intervals	WC	-
4.	Backfilling and compaction in specified layers along with application of emulsifier along the sides of masonry & RCC structures	WC	S
5.	Compaction of top surface for taking dosage of emulsifier by roding the earth at specified intervals for the entire floor area before concreting	WC	-
6.	Check for consumption of emulsifier utilized	WC	S
7.	Shelf life of anti-termite chemical	WC	S
8.	Guarantee Certificate for performance	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO : 2772

PLASTERING

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Check for completeness of all hidden jobs like piping, conduiting, etc.	WC	-	-
2..	Check for grading of sand, Mix proportion	WC	S	S
3.	Mortar Cube casting & its testing	WC	S	S
4.	Use of Chicken mesh of given gauge at junction of concrete & masonry.	WC	S	S
5.	Sample preparation for finish and its approval	WC	W	S
6.	Neeru application on plaster (as applicable)	WC	S	-
7.	Hacking and cleaning the surface, removing loose particles, wetting the surface	WC	S	S
8.	Leaving plaster rough where tiles are to be fixed	WC	-	-
9.	Checking of plaster thickness, plumb & even surface	WC	S	-
10.	Check for grooves, openings, rounding off the corners, hollowness in plaster	WC	S	S
11.	Checking for use of waterproofing compound , Mix proportion(as applicable)	WC	S	S
12.	Curing	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	-

CAT B: Area requiring special finish (e.g. pebble dash finish etc.)
CAT C: Balance works.

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ITP NO. : **2773**

DOORS, ROLLING SHUTTERS, WINDOWS AND VENTILATORS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Check for sections & dimensions	WC	S	-
3.	Line, level & plumb	WC	-	-
4.	Section joinery details	WC	Rw	-
5.	Check for orientation/ opening direction	WC	S	S
6.	Grouting with lugs/ dash fasteners	WC	-	
7.	Check for fixtures & fittings	WC	S	S
8	Check for thickness & type of glazing	WC	-	-
9.	Check for rubber gasket, anodizing (as applicable)	WC	-	-
10	Brand/ shade of paints, no. of coats including surface preparation (as applicable)	WC	S	Rw
11.	Check for fire rated certificate for fire doors/ windows/ partitions	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

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ITP NO. : 2774

PAINTING (BUILDING WORKS)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Completion of surface preparation	WC	S	S
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Confirmation of colour, shade & brand	WC	S	S
4.	Check for base surface preparation (Putty/ POP, Primer, rendering etc.)	WC	S	-
5.	Check for number of coats and thickness	WC	S	S
6.	Final check for touch up, repairs etc.	WC	S	-
7.	Curing, if any	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

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ITP NO. : 2775

SANITARY FITTINGS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Checking of sample (as applicable)	WC	S	-
3.	Check completeness of finishing works w.r.t. line, level & position	WC	S	-
4.	Check proper fixing of the sanitary fittings to give aesthetic appeal	WC	S	-
5.	Check for leakage/ testing at given pressure	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

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ITP NO. : 2776

WATER PROOFING (ROOF)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Surface preparation for screeding/ water proof plastering	WC	S
2.	Mix proportion, thickness of screeding/ plastering & slope towards rain water pipes	WC	S
3.	Formation of groove at specified height on parapet wall/ pedestal/ columns etc.	WC	S
4.	Incoming material inspection, no. of coats, application procedure and consumption.	WC	S/Note 1
5.	Lapping (along the length & in transverse direction) of waterproofing membrane.	WC	S
6.	Termination of material in groove on vertical plane	WC	S
7.	Check for hollowness, bubbles in water proofing, if any	WC	S
8.	Conducting a sample of water proofing test by flooding the area for specified interval (as applicable)	WC	S
9.	Check for protective layer of PCC over waterproofing with chicken wire mesh, groove cutting, sealant filling.	WC	S
10.	Cleaning of surface	WC	-
11.	Submission of Guarantee in the requisite Performa	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO : **2777**

FALSE FLOORING AND FALSE CEILING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
	FALSE FLOORING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Cleaning base floor	WC	S
4.	Painting base floor with Polyurethane based paint (as specified)	WC	S
5.	Check for cutouts in floor, anchor fasteners in floor, studs spacing etc.	WC	S
6.	Proper line, level & layout	WC	S
	FALSE CEILING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Surface preparation of panel boards	WC	-
4.	Proper line, level & cut-outs	WC	S
5.	Finishing of panel boards	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO. : 2778

UNDER DECK INSULATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material checking including density	WC	Note 1
2.	Checking of adhesive, fasteners for anchorage	WC	S
3.	Fixing of scaffolding, ladders, platforms	WC	S
4.	Fixing of under-deck insulation with adhesive	WC	S
5.	Use of chicken wire mesh while fixing the insulation sheet.	WC	S
6.	Fixing of dash fasteners at defined spacing	WC	-
7.	Finishing	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO. : 2779

ROOFING ACCESSORIES

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	HP/Note 1	HP/Note 1
2.	Check for mitring, overhang, laps, etc.	WC	S	-
3.	Slopes line, level of sheets, barge boards, ridges & gutters, overhang of sheets	WC	S	-
4.	Checking for profile, coating, shade of sheet.	WC	S	-
4.	Bolting by drilling only, length of bolts, nos., anodizing and type of washers	WC	S	-
5.	Check for slopes of rain gutters, down take pipes, north lighting curves/ supports for gutters	WC	S	-
6.	Check for wind ties installation of required dimensions	WC	S	-
7.	Check for leakage/ passing of light	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

2) Fixing arrangement need to be reviewed with respect to contract specifications.

CAT B: Important structures (e.g. Compressor House, Warehouse and Pump House etc.)
CAT C: Balance works.

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ITP NO. : 2799

LIGHTING WORKS (NON PLANT BUILDINGS)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Prepare detailed conduit layout diagram as per the approved electrical drawing	WC	Rw
2.	Provide /PVC/GI sleeves in columns/beams at identified locations to facilitate laying of conduit on later date.	WC	S
3.	Ensure conduit & accessories material is inspected at site before using	WC	Note-1
4.	Ensure that the conduit is laid in line with execution drawings & provide pull-wires as per requirement.	WC	S
5.	Check correctness of drop/JB locations	WC	S
6.	Check threaded joints are proper	WC	S
7.	Ensure all JB/Fan box are properly stuffed with jute	WC	S
8.	Ensure conduits are properly tied to reinforcement bars to prevent floating during concrete	WC	S
9.	Ensure proper supporting of conduit lengths wherever required	WC	S
10.	Ensure adequate chasing depth for conduit portion coming inside brick walls	WC	S
11.	Check workmanship towards joints and presence of any foreign material inside the conduits	WC	S
12.	Ensure wiring material is inspected at site before use & colour code is checked.	WC	Note-1
13.	Ensure correctness of lighting wire size and no. of wires as per the drawing in each conduit portion	WC	S
14.	Preparation of "As Built" drgs.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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विद्युत कार्यों (ईपीसीसी/ एकमुश्त टर्नकी संविदाओं) के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP) FOR ELECTRICAL WORKS (EPCC/LSTK CONTRACTS)

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by: Standards Committee Convenor	Approved by: Standards Bureau Chairman
4	29.08.2023	Revised and Updated	DK	DG	RKS	SM
3	23.07.2018	Revised and Updated	SKG	AP	AKK	RKT
2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	12.09.2006	ISSUED AS STANDARD SPECIFICATION	AS	MPJ	VNP	VC

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Abbreviations:

AC	:	Alternating Current
AFC	:	Approved For Construction
AVR	:	Automatic Voltage Regulator
BB	:	Blue Blue
BDV	:	Break Down Voltage
CB	:	Circuit Breaker
CT	:	Current Transformer
DC	:	Direct Current
EHT	:	Extra High Tension
EIL	:	Engineers India Limited
EMCC	:	Emergency Motor Control Centre
GI	:	Galvanised Iron
HV	:	High Voltage
IR	:	Insulation Resistance
JB	:	Junction Box
LT	:	Low Tension
LV	:	Low Voltage
MCC	:	Motor Control Centre
MV	:	Medium Voltage
NGR	:	Neutral Grounding Resistance
OLTC	:	On Load Tap Changer
OTI	:	Oil Temperature Indicator
PCC	:	Power Control Centre
PI	:	Polarization Index
PMG	:	Permanent Magnet Generator
PT	:	Potential Transformer
R_{CT}	:	Resistance of Current Transformer
RR	:	Red Red
SWGR	:	Switch Gear
WTI	:	Winding Temperature Indicator
YY	:	Yellow Yellow

Construction Standards Committee

Convenor: Sh. R K Singh, ED (Construction)

Members: Sh. Janak Kishore, ED (Projects)
Sh. Chinmoy Kapuria, CGM (SCM)
Sh. Udayan Chakravarty, Sr. GM (Piping)
Sh. Debasish Ghosal, GM (Construction)
Sh. Pankaj Kumar Rai, DGM (Construction)

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5.	Installation/ erection & testing of EHT/ HT main bus and allied equipment's	2820	14
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GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general role of EIL has been specified in the document. The role of owner, to be specified during preparation of site specific ITPs

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : **Hold Point ;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : **Witness Point ;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized beforehand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw : **Review** of Contractor's documentation.

S : **Surveillance** Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, etc.

WC : **100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages

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ITP NO.: 2801

INSTALLATION/ ERECTION & TESTING OF TRANSFORMER

Sl. No.	Activity	Contractor	EIL		
			CAT A	CAT B	CAT C
1.	Incoming Material inspection at site	WC	Note-1	Note-1	Note-1
2.	Check foundation, its cleanliness, level and center lines, Anchor bolts/insert plates, their position & straightness, flatness of contacting surface for transformer skid. In case of Rail mounted type, check center line and levels of rails.	WC	S	S	S
3.	Check the Transformer no. and rating as per drawings and purged gas/ air pressure & oil leakage, physical damage etc.	WC	S	--	--
4.	Check sequence of installation e.g. main tank first + radiators + accessories + internal check as per installation flow chart.	WC	S	--	--
5.	Ensure the cleanliness of connecting part e.g. flange parts and maintenance of duly tight blank flanges until commencement of assembly	WC	S	--	--
6.	Check bushing cracks, chips or presence of paint or dirt. Bushing should be cleaned as per vendor's instruction. Check explosion vent assembly & healthiness of diaphragm	WC	S	--	--
7.	After completing assembly of all parts, filling of tank and OLTC with transformer oil, operation of OLTC (prior to filling the Transformer oil, each drum must be tested against di-electric strength for minimum as per specifications)	WC	S	--	--

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ITP NO.: 2801

INSTALLATION/ ERECTION & TESTING OF TRANSFORMER (contd.)

Sl. No.	Activity	Contractor	EIL		
			CAT A	CAT B	CAT C
8.	Check & ensure bus duct connection at both ends.	WC	S	S	S
9.	Ensure cable connection at the cable & box, their colour coding & tightness. Use of spring and flat washers on the appropriate faces to be confirmed) and cleanliness of lapping surfaces. For multiple cable connection, check for correctness of RR, YY, BB grouping	WC	S	--	--
10.	If specified, fill the cable end box with tested transformer oil and ensure oil levels	WC	S	--	--
11.	Check the use of proper size conductors/ cables for HV/LV, neutral connection and their connection to NGR or earth grid/ earth point	WC	S	--	--
12.	Check equipment earthing, connections, tightness and earth resistance value on each earth pit	WC	S	S	--
13.	Ensure earthing of tertiary winding if applicable	WC	S	--	--
14.	Check leakage and oil level	WC	S	--	--
15.	Check oil filtration before energization & check BDV of oil(as applicable)	WC	S	--	--
16.	Check proper installation of Dessicants (reactivate the silica gel to blue; oil traps to be filled up)	WC	S	--	--
17.	Measure winding resistance at each tap	WC	S	--	--
18.	a) Test insulation resistance & PI	WC	S	--	--
	b) Ensure heat run/ dehydration of transformer	WC	W	S	--
	c) Check final IR value after dehydration and temp. Vs IR curve to ensure drying	WC	S	S	--
19.	Test vector group polarity, magnetizing current, magnetic balancing	WC	W	S	--

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ITP NO.: 2801

INSTALLATION/ ERECTION & TESTING OF TRANSFORMER (contd.)

Sl. No.	Activity	Contractor	EIL		
			CAT A	CAT B	CAT C
20.	Test transformation ratio at each tap points (injecting 3 phase, 415 V at primary)	WC	W	S	--
21.	Ensure laying, termination & connection of all control &Signal cables as per cable schedule	WC	S	S	--
22.	Check Bucholtz's relay operation by air injection for both transformer & OLTC, MOG for alarm and trip contacts' function	WC	W	--	--
23.	Check setting of Fan control (auto & manual), OTI, WTI - alarm and trip	WC	S	S	--
24.	Check tap changer control/ operation- both auto & manual – without energizing the transformer. Ensure master/ followers' correct functioning	WC	S	--	--
25.	Final residual check to confirm removal of all temporary supports/ spacers, tags, accumulation of air in Buchhelz relay, oil, if any, etc., which might have been used as protection/ and identification during transportation and erection	WC	S	--	--
26.	Stability check, (Restricted (64R)/ standby Earth fault (51G)/ Transformer differential(87T), (as applicable)	WC	W	--	--
27.	Check CT Ratio & Polarity	WC	W	--	--
28.	Check Transformer protection relay settings as per Relay Setting chart	WC	W	S	--
29.	Mechanical Acceptance Test/ Energisation protocol of transformer	WC	HP	HP	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010

CAT A: Power & Distribution Transformers,
CAT B: Lighting transformers
CAT C : Miscellaneous transformers like isolation transformers, etc.

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ITP NO.: 2805

INSTALLATION/ ERECTION & TESTING OF MOTOR

Sl. No.	Activity	Contractor	EIL		
			CAT A	CAT B	CAT C
1.	Incoming material inspection	WC	Note-1	Note-1	Note-1
2.	Check for foundation, it's level & center line markings, ensure the depth of anchor grouting pockets and straightness of anchor bolts. Foundation should be thoroughly cleaned before placement of motor	WC	Rw	Rw	Rw
3.	Check motor name plate, identify the equipment referring to vendor's shop floor test certificate and construction drawing	WC	S	S	--
4.	Check type of motor as per area classification drgs duly approved by the Competent Authority	WC	S	S	S
5.	Check and ensure physically the suitability of the supplied/available Cable glands with Cables and Motor side cable entry	WC	S	S	--
6.	Check lubrication of bearings, their suitability and level. For lubricants, vendor instructions and specifications to be followed	WC	W	S	--
7.	Ensure sealing of all exposed outlets during erection/ assembly	WC	--	--	--
8.	Ensure air-gap as per vendor instruction (for big machines assembled at site)	WC	Rw	--	--
9.	Check proper earthing of the motor and earth connection	WC	S	S	S

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ITP NO.: **2805**

INSTALLATION/ ERECTION & TESTING OF MOTOR

Sl. No.	Activity	Contractor	EIL		
			CAT A	CAT B	CAT C
9.	a. Check IR and PI for the motor and IR for auxiliary circuits like heaters and Thermal detectors, excitor (for synchronous motor), etc.	WC	W	S	--
	b. In case of low IR/ PI, Improve IR value as per spec/ suitable method as per vendors' recommendation.	WC	W	S	--
10.	Measure winding Resistance (if specified in spec)	WC	S	S	--
11.	Inspect space heater and control cable connections. Ensure the tightness of connection, proper glanding & earthing of armour, correct phase sequence of supply cable as per mark and closing the covers of terminal boxes.	WC	S	--	--
12.	Check for de-coupling of motor for no-load run and ensure re-coupling of the motor after verification of original alignment.	WC	S	S	--
13.	Set the temperature indicators (alarm/ trip) and vibration monitors (if any)	WC	S	--	--
14.	Check motor protection relay settings as per Relay Setting diagram	WC	W	W	--
15.	Check provision of CTs in power/ neutrals as per requirement of specifications. Visually check name plates of CT's and ensure their ratio, accuracy class and proper grounding as per approved drawings. Test their polarity ratio and stability. Do the cable termination at CT terminal boxes.	WC	W	S	--
16.	Check operation of synchronizing panel for synchronous motor.	WC	S	--	--
17.	Perform no load run of motor - record vibration, Temp rise, current, speed, Starting current/No load current etc.	WC	W	W	--
18.	Mechanical Acceptance Test/Energisation Protocol	WC	HP	HP	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010

CAT A : HV& MV motors above 132 KW, all MV motors in hazardous area
CAT B : MV motors up to 132 KW in non-hazardous area
CAT C : Others .

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ITP NO.: 2810

INSTALLATION/ ERECTION & TESTING OF GENERATOR

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note-1	Note-1
2.	Check for foundation, its level & center line markings, ensure the depth of anchor grouting pockets and straightness of anchor bolts. Foundation should be thoroughly cleaned before placement of equipment	WC	Rw	Rw
3.	Check equipment's as per approved area classification drawings	WC	S	S
4.	Ensure sealing of all exposed outlets during erection/ assembly	WC	S	S
5.	Check for installation of equipment, its leveling, alignment and coupling with driven equipment (before coupling magnetic centering must be ensured)	-	-	-
	a. Level/elevation of base frame	WC	S	-
	b. Checking of foundation bolts (for location, threading, greasing, etc.)	WC	S	-
	c. Checking orientation of generator	WC	S	-
	d. Placement of Crane(s), if applicable	WC	S	-
	e. Elevation/level of generator and placement of shims/packings as per AFC drawings	WC	S	-
	f. Distance between couplings	WC	S	-
	g. Rough alignment of generator	WC	S	-
	h. Availability of Vendor's engineer at site (if applicable)	WC	S	-
	i. Cleaning of pockets/ grouting of foundation bolts' pockets/base frame	WC	S	-
	j. Final Alignment	WC	S	-
	k. All protection & safety guards installation	WC	S	-
6.	Ensure pedestal insulation	WC	S	-
7.	Check lubrication of bearings, their suitability and level. For lubricants, vendor instructions and specifications to be followed	WC	S	-
8.	a. Ensure air-gap as per vendor instruction (for big machines assembled at site)	WC	S	-
	b. Check & Ensure magnetic centering before coupling	WC	S	-
	c. Check proper coupling with driven equipment	WC	S	-
9.	Check earthing of the equipment and earth connection including NGR. Ensure earth resistance as per the requirement			
	a) Check IR and PI for the equipment and IR for auxiliary circuits like heaters and Thermal detectors, excitor PMG, etc.	WC	W	S
	b) In case of low IR/PI, Improve IR value by suitable method as per vendors' recommendation	WC	W	W
10.	Measure winding Resistance	WC	W	S

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ITP NO.: 2810

INSTALLATION/ ERECTION & TESTING OF GENERATOR

Sl No	Activity	Contractor	EIL	
			CAT A	CAT B
11.	Inspect exciter control panel/ space heater and control cable connections. Ensure the tightness of connection, proper glanding and earthing of armour correct phase sequence of supply cable as per mark and closing the covers of terminal boxes.	WC	S	S
12.	Set the temperature indicators (alarm/ trip) and vibration monitors	WC	S	-
13.	Check the provision of generator CT/PT and its inter connection with others as per approved drgs. Do the cable termination at CT/PT terminal boxes. Visually check nameplates of PT/CT's and ensure their ratio accuracy, class and proper grounding against approved drgs. Test their polarity ratio.	WC	W	S
14.	Check generator control panel, its wiring as per drg. Relay & their calibration & setting, functional checks, etc.	WC	W	S
15.	Check performance/operation of following protection relays with Primary/Secondary injection	WC	W	S
	a) Differential protection			
	b) Negative phase sequence test			
	c) Earth Fault (E/F)			
	d) Open circuit/Rotor earth fault			
	e) Over Voltage/Residual over voltage & Reverse power			
	f) Time over current and short circuit			
	g) Loss of excitation			
	h) Current Unbalance			
	i) Under & Over frequency and frequency rate change			
	j) Loss of excitation			
16.	Check for synchronizing & manual excitation control function	WC	W	S
17.	Check AVR operation & settings	WC	W	S
18.	Mechanical acceptance test/ Energization protocol	WC	HP	HP
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A : Generators above 1000KW
CAT B : Generators upto 1000KW

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ITP NO.: 2815

INSTALLATION/ ERECTION & TESTING OF SWITCH GEARS/ PCC/ MCC/ EMCC/ VFD's/ ASB/ LIGHTING PANELS

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
1.	Incoming material Inspection	WC	Note-1	Note-1
2.	Check the layout of base channels/frames and ensure the correct provisions for grouting/welding and cable entry openings.	WC	S	S
3.	Ensure proper grouting/welding of the base channels/frames	WC	S	-
4.	Check sequence wise (starting from center or Bus-duct panel) installation, final leveling and bolting up	WC	S	-
5.	Check main bus bar connection at all shipping sections and shrouding at all tap-off points	WC	S	-
6.	Check inter panel wiring after fixing of loose accessories and wiring	WC	S	-
7.	Ensure the level of flooring for smooth opening of panel doors and drawing out & in operation of Breaker Trolleys	WC	S	-
8.	Check equipment earthing & continuity of earth bus	WC	S	S
9.	Ensure thorough cleaning, removal of temporary spacers, supports, any foreign materials and dusting the panels	WC	S	S
10.	Verify the correctness, in accordance with the drawings, of all type of relays, test blocks, control switches, meters & instruments, motor starters, fuses, space heaters, etc.	WC	Rw	Rw
11.	Check name plate for each breaker, inspect & test the operating mechanics (Mechanically), interlocks, contacts, arc chutes, auxiliary devices and adjustments as required	WC	S	S
12.	Visually check all relays and meters for removal of shipping blocks and for mechanical damage. Ensure their range against approved drawings, inspect calibration, testing and setting for each relay and meter.	WC	S	S
13.	Visually check name plates of CT's and PT's and ensure their ratio, accuracy class and proper grounding against approved drawings. Test their polarity, knee point voltage, R_{CT} and ratio. Primary injection tests at three points on the characteristics curve as per manufacturer recommendation.	WC	W	S

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ITP NO.: **2815**

INSTALLATION/ ERECTION & TESTING OF SWITCH GEARS/ PCC/ MCC/ EMCC/ VFD's/ ASB/ LIGHTING PANELS

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
14.	Test and witness IR value of the power and control bus	WC	W	W
15.	Test and witness high pot tests, as specified	WC	HP	HP
16.	Check phasing & phase sequence between bus section and incomer.	WC	W	W
17.	Inspect secondary injection test and ensure tripping of C.B. through protection relays	WC	W	S
18.	Inspect primary injection & check the breaker tripping through protective relays, check ammeter, voltmeter, power factor indications etc. for proper functioning	WC	W	S
19.	Switch on AC & DC control supply. Check the sequence of operation of breakers electrically, local and remote interlock; ensure proper alarm and annunciation and indications in SW/ GR/ MCC/ Control Panel. Auto/ Independent/ manual mode of operation of incomer & bus coupler shall be checked as per schematics. Under voltage tripping of breakers shall be verified.	WC	W	W
20.	Measure contact resistance and ensure simultaneous closing & making of breaker contacts.	WC	W	S
21.	Check for relay parameters and settings	WC	W	S
22.	Differential stability (as applicable) shall be verified.	WC	S	-
23.	Checking of Man machine communication and verification of graphics	WC	S	S
24.	Mechanical Acceptance Test/Energisation protocol	WC	HP	HP
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: HT Switch Gears / PCC Control Panels/ VFD's
CAT B: MCC / EMCC/ASB/ lighting panels.

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ITP NO.: 2820

INSTALLATION/ ERECTION & TESTING OF EHT/ HT MAIN BUS AND ALLIED EQUIPMENTS

Sl. No.	Activity	Contractor	EIL
		CAT A	CAT B
1.	Incoming Material Inspections	WC	Note-1
2.	Check the insulators wall bushing for any damage like chips or cracks. Ensure proper installation of the insulators & bushing	WC	S
3.	Check the clearance between conductor to ground & conductor to floor level. Ensure minimum clearance between two conductor Bus	WC	S
4.	Check the anchoring of the conductor bus and terminal/Tap Off connections	WC	S
5.	Ensure correctness of phase sequence	WC	W
6.	Check earth connections and measure earth resistance of the supporting structures of insulators	WC	S
7.	Check IR value of the conductor bus phase to phase and each phase to earth.	WC	W
8.	Check operation of isolators, CB, earth switch and interlocks, check ratio & polarity of CTs, PTs	WC	S
9.	Check high voltage tests keeping all the CB's and isolators closed but PT's should be disconnected	WC	W
10.	Check hot line insulator washing equipment and system-Nozzle position & resistivity of water	WC	S
11.	Check type & class of lighting arrestor, its earth connection and earth resistance	WC	S
12.	Mechanical Acceptance Test/ Energisation protocol	WC	HP
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO.: 2825

CABLE LAYING

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
1.	Incoming material Inspection	WC	Note-1	Note-1
2.	Survey the cable route as per AFC drawings, identify any possible obstruction like road/pipe rack crossing, heat sources etc. and finalize the cable route	WC	S	S
3.	Prepare cable drum schedule to avoid wastage and minimize cable joints	WC	Rw	Rw
4.	Ensure entire route is available for cable trench	WC	S	S
5.	Ensure availability of cables of required size and length	WC	--	--
6.	Verify the dimensions of buried trench as per AFC drawings (in case of buried cables)	WC	S	S
7.	Ensure readiness of cable trays and installation of GI pipes (for cable protection) wherever required	WC	-	-
8.	Ensure the initial bed of sand is provided as per standard and of required thickness	WC	S	S
9.	Check IR Lay cables as per the cable schedule to avoid criss-crossing of cables within the trench (1st layer). Check IR Values in drum before laying.	WC	S	S
10.	Provide cable tags at specified locations	WC	Rw	Rw
11.	Record IR value of cables of first layer after sand filling	WC	Rw	Rw
12.	Provide second layer of sand, and ensure proper clearance between HT/LT cables (wherever applicable)	WC	S	S
13.	Complete layer wise laying of cables and sand filling	WC	S	S
14.	Record IR value of cables of each layer after sand filling	WC	Rw	S
15.	Provide final layer of sand	WC	S	S

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ITP NO.: **2825**

CABLE LAYING

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
16.	Provide bricks/slabs for cable protection in buried trenches	WC	S	S
17.	Back fill the trenches with earth and compact properly after ensuring the completion of earthing works, if any as per earthing layout drawings.	WC	S	S
18.	Install cover slabs and seal the trenches in plant/offsite areas after ensuring the completion of earthing works, if any.	WC	S	S
19.	Remove surplus earth generated as per provisions in the contract.	WC	S	S
20.	Hi pot test of cables as required.(as applicable)	WC	W	W
21.	Provide cable markers as per the specifications at identified locations	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A : All HT/HV cable works.
CAT B: All LT/MV cable works and control cable laying works.

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ITP NO.: 2830
LIGHTING SYSTEM

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note-1	Note-1
2.	Mounting of receptacles/mast/poles as per drawings & standards.	WC	S	S
3.	On walkways, platforms & outdoor areas, lighting fixtures are located nearer to landing of stairs/ ladders, gauges, flow meters etc.	WC	-	-
4.	Provision of plugs for spare entry/ sockets. Erection of lighting poles/ fixtures manually on concrete foundations as per drawings.	WC	S	S
5.	Check earth continuity for individual sockets/ outlets as well as for the complete lighting system	WC	S	S
6.	Ensure lighting circuit are marked as per AS Built drawing.	WC	S	S
7.	Ensure luminaries for emergency purpose carry identification marks.	WC	S	S
8.	Illumination level checking after completion of all indoor & outdoor lighting activities.	WC	W	S
9.	Load balancing of LDB	WC	Rw	Rw
10.	Welding/ bolting of poles to base/ foundation. Check for verticality of poles alignment adjustments as required,	WC	S	S
11.	Ensure cable termination, earth continuity , etc. and sealing of spare entries of JBs	WC	S	S
12.	Ensure touch-up painting or galvoseal application done at affected areas to arrest corrosion.	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A : All lighting works in Hazardous area, escape routes.
CAT B : All lighting works in Non-hazardous areas and general office areas.

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ITP NO: 2835

EARTHING SYSTEM

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
1.	Incoming material Inspection	WC	Note1	Note1
2.	Ensure the electrodes have a clean surface, free from non-conducting materials like paint, grease etc.	WC	S	S
3.	Check the earth pit is backfilled by using alternate layers of charcoal & common salt and individually numbered for identification.	WC	S	S
4.	Measure earth resistance of each earth pit/electrode installed.	WC	S /Rw	S /Rw
5.	Check top level of the earth pit is matched with FFL in paved area and 100 mm above FGL in unpaved area	WC	S	S
6.	Ensure earthing grids are installed as per the pre-determined layout & earthing conductors are at a depth specified in the specifications from the grade level.	WC	S	S
7.	Ensure weld joints are made by overlapping the strip equivalent to double the width of the strip and four sides (three on Top and one on the bottom) shall be continuously welded	WC	S	S
8.	Check all joints of the conductors below the grade level are welded & suitably protected by application of two coats of bitumen & wrapping with the Jute/Hessian Tape. Earthing strips laid above ground are welded and protected by applying two coats of bitumen.	WC	S	S
9.	Ensure the joints are inspected before the coat application & backfilling.	WC	S	S

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ITP NO: **2835**

EARTHING SYSTEM

Sl. No.	Activity	Contractor	EIL	
			CAT A	CAT B
10.	Ensure all the risers are clamped to the walls, columns, etc.	WC	S	S
11.	Ensure all the MV & HV electrical equipment's are doubly earthed by connecting two points on the equipment to the earth grid. Rest of the structural, mechanical, piping is connected to the earth grid as per the contract specifications & drawings.	WC	S	--
12.	Ensure all process pipelines are bonded & earthed at entry & exit points of battery limit of hazardous area.	WC	S	--
13.	Ensure lightening protection grid is connected to the individual electrode and bonded to the main earth grid at two or more points as per the drawings.	WC	S	S
14.	Ensure each lighting fixture & receptacle is earthed through extra core provided in the lighting cable (normally, the third core of a 3 core cable)	WC	S/Rw	Rw
15.	Removal of surplus earth generated as per provisions of the contract.	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A : All earthing in hazardous areas/ communication/ control systems.
CAT B : Earthing in non-hazardous area.

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ITP NO.: **2840**

INSTALLATION OF BUS DUCT

Sl. No.	Activity	Contractor	EIL
1.	Incoming Material inspection at site	WC	Note 1
2.	Ensure that the switch board terminal box & the transformer terminal boxes are inspected & cleared before proceeding to the bus duct installation.	WC	S
3.	Check the equipment no. and rating as per drawings, no physical damage, etc.	WC	S
4.	Check availability of all accessories	WC	S
5.	Inspect the bus duct insulators for any physical damage occurred during the transit.	WC	S
6.	Check bushing cracks, chips or presence of paint or dirt. Bushing cleaned as per vendor's instruction.	WC	S
7.	Ensure various sections of the bus duct enclosures are coupled together by using proper gaskets & bellows as specified.	WC	S
8.	Ensure the bus bars are properly fixed & coupled on the insulator and correct phases are connected at both ends.	WC	S
9.	Ensure bus bar bolts are tightened to the required torque values) using calibrated torque wrench.	WC	S
10.	Ensure bus bar joints are insulated using manufacturers recommended materials, wherever required.	WC	**S**
11.	Prior to closing of the bus duct cover, ensure that the bus duct enclosures are cleared of tools/ loose materials and debris.	WC	W
12.	Ensure enclosure of bus duct earthed (to the earthing grid) as per drawing.	WC	S
13.	Ensure wall sealing is done & sun shields provided as per drawings.	WC	S
14.	Ensure bus bar joints are cleaned/ polished & not oxidized before bolt-up connection.	WC	W
15.	Ensure provisions of breathers/silica gel and Drain plugs	WC	S
16.	Ensure provision of heaters and recording of its IR value	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

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ITP NO.: **2845**

CABLE TERMINATION

Sl. No.	Activity	Contractor	EIL
1.	Ensure proper tagging of the cable at both ends.	WC	S
2.	Ensure cables are properly dressed, clamped & glanded using suitable sizes/ class of cable glands.	WC	S
3.	Ensure sufficient cable length is kept on both ends for future re-termination, if need arises.	WC	S
4.	Ensure proper bending radius while laying to avoid twisting.	WC	--
5.	Ensure cable segregation, spacing & depths maintained as per specifications	WC	S
6.	Ensure usage of correct sizes of lugs for termination	WC	S
7.	Ensure all cores are firmly terminated to terminals provided in individual feeders.	WC	S
8.	Ensure proper earthing of armour.	WC	S
9.	Ensure continuity & IR value checks are done on the cable from panels to equipment's.	WC	S/Rw
10.	Ensure unused entries are plugged tightly in panels, motor terminal boxes, JB's, etc	WC	S
11.	Ensure on completion of cable termination, the cable trenches are backfilled & trench covers put back in position.	WC	S
12.	Ensure all cable openings & conduit entries are properly sealed.	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ठेकेदार द्वारा सप्लाई की गई सामग्रियों के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी) अथवा आवक सामग्री की जांच

INSPECTION & TEST PLAN (ITP) FOR INCOMING MATERIAL CHECKING FOR CONTRACTOR'S SUPPLIED MATERIALS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
3	29.08.2023	REVISED AND REISSUED	DJ	DG	RKS	SM
2	27.07.2018	REVISED AND REISSUED	SKG	AP	AKK	RKT
1	14.10.2015	REVISED AND REISSUED	DJ	MKG	TKS	SC
0	04.07.2011	ISSUED FOR IMPLEMENTATION	SM	SM	MKG	

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Abbreviations:

ATT	:	Anti Termite Treatment
CGI	:	Corrugated Galvanized Iron
CS	:	Carbon Steel
EOT	:	Electric Operated Traction
FLM	:	Flood Light Mast
HOT	:	Heat Operated Traction
HT	:	High Tension
HV	:	High voltage
IMIR	:	Incoming Material Inspection Report.
IRN	:	Inspection Release Note
ITP	:	Inspection Test Plan
KW	:	Kilo Watt
LR	:	Lorry Receipt
LT	:	Low Tension
LV	:	Low Voltage
LEL	:	Low Explosive Limit
MOC	:	Material of Construction
MTC	:	Manufacture Test Certificate
NACE	:	National Association of Corrosion Engineers
PLC	:	Programmable Logic Control
PRDS	:	Pressure Reducing and De-superheating Stations
QAP	:	Quality Assurance Plan
RCC	:	Reinforced Cement Concrete
SS	:	Stainless Steel
SOR	:	Schedule Of Rates
TC	:	Test Certificate
TPIA	:	Third Party Inspection Agency

Construction Standards Committee

Convenor: Sh. Rupesh Kumar Singh , ED (Construction)

Members: Sh. Janak Kishore, ED (Projects),
Sh. Chinmoy Kapuria, CGM (SCM),
Sh. Udayan Chakravarty, Sr. GM (Piping),
Sh. Debasish Ghosal, GM (Construction),
Sh. Pankaj Kumar Rai, DGM (Construction),

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CONTENTS

S.NO.	DESCRIPTION	PAGE NO.
1.	General Note & Legend	04
2.	Inspection & Test Plan	05
	Format for Incoming Material Inspection Report	08

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GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP **: Hold Point**

A point which requires inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W **: Witness Point**

An activity which requires witnessing by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw **: Review** of Contractor's documentation.

S **: Surveillance** Inspection by Owner/ EIL.

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, review of quality documentation & records.

WC **: 100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages.

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SL NO	ACTIVITY	CONTRACTOR	EIL/OWNER($)			Records to be submitted/ Format No:
			CAT 1	CAT2	CAT 3	
A	**Document Checking**					
1	Check whether vendor/source is approved.	WC	HP	Rw	Rw	G-01
2	Availability of QAP/ITP duly approved by TPIA.	WC	Rw	Rw	Rw	G-01
3	Availability of MTC / IRN (Availability of stage wise Inspection Reports/certificates in case of inspection by TPIA, Inspection reports of Contractor).	WC	Rw	Rw	Rw	G-01
4	Availability of certificates from statutory bodies, if applicable	WC	Rw	Rw	Rw	
5	Delivery challan /LR/ E-way Bill/ Tax Invoice	WC	Rw	Rw	-	G-01
6	For Foreign Items: Bill of landing, Country of origin, Packing List, phytosanitary certificate, bill of entry, customs invoice (as applicable)	WC	Rw	Rw	-	
B	**Physical Verification**					
1	Checking for Inspection stamp/Identification mark	WC	W*	S	S	G-01
2	Correlation of MTC w.r.t. Heat nos/ Batch no /lot no.	WC	HP	Rw*	Rw*	G-01
3	Physical assessment of Quantity.	WC	S	S	-	G-01
4	Certification of condition of material.	WC	S	S	S	G-01
C	Sampling for Field tests / tests from approved laboratories, if applicable.	WC	W	W	W	G-01
D	Review of Field Test reports/Test reports if applicable.	WC	Rw	Rw	Rw	G-01
E	Review MTC/IRN/TC etc.	WC	Rw	Rw	Rw	G-01
F	Endorsement on IMIR	WC	HP	HP	Rw	G-01

NOTE:

- **($)**A generic categorization plan could be firmed based on following guideline and as per Table A:-
- **(*)**Sampling plan for checking of bulk items shall be as per discretion of EIL
- General :

1) EIL/OWNER and contractor shall jointly finalize the list of incoming materials and categorize in line with inspection categorization plan for bought out items. The items not covered in Table A shall be finalized by Engineer In charge /Owner.
2) In general Sl no of the ITP: A (1, 3, 4 & 5) B, E and F shall be applicable to both (#) and (@) i.e. Items with and without TPI/EIL inspection
3) In general Sl no of the ITP: A (2), shall be applicable to (@) ie. Items with TPI/EIL inspection
4) In general Sl no. of ITP: C and D shall be applicable to (#) ie. Items without TPI/EIL inspection.

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5) All items to be procured from approved vendors / source as per list enclosed in the contract / approved vendor list. Prior approval for the source / vendor to be taken for items not listed in the contract / approved vendor list.

6) Anodisation / galvanization shall be ensured in shops having proven track record and samples are to be tested to check galvanizing / anodizing prior to dispatch to sites.

CAT 1 CRITICAL: The materials requiring long time impact to meet the stipulation of end user. Completely engineered and inspected as per the contract.

CAT 2 MAJOR: The materials requiring lesser time impact on end user. Specified to Industry standards, lower design category (not fully reviewed of detailed Engg but all interfaces checked) and with complete compliance with code, however requiring limited inspection.

CAT 3 MINOR: Standard items, fit for the purpose with minimal Engg review.

TABLE: A

SL NO	CAT 1 (CRITICAL)	CAT 2 (MAJOR)	CAT 3 (MINOR)
		Items without TPI/EIL inspection (#)	
1	Refractory materials	• Cement • Reinforcement • Structural steel • Brick and tile brick • Asphalt(bitumen) • Paint • Sanitary wares • sanitary fittings(pipes & fittings) • Chemicals for ATT • Acid resistant tiles and mortar • Marble/ Granite/ Ceramic Tiles • Chemical hardener for flooring • Grouting compound • Wood for doors and windows • Ventilator • Flush door • Paneled door • Roof treatment materials • False ceiling & flooring materials • RCC Hume pipes • Anchor fasteners • Foundation bolts • Waterproofing Materials • Underdeck insulation materials • Water stopper/ HDPE/ LDPE Sheet • Vermiculite based cementious fireproofing materials	• AC sheets/CGI sheets • Particle board • Glazing glass • All galvanized • anodized items like GI pipes • door/window frames • Pre-coated sheets • Steel doors • Rolling shutters • Cable ducts/trays • lightning arrestors • street light poles • Earthing items • Conduits/wire/Metsec Channels • Safe area Lightning fixtures • SS Handrails • UPVC/CPVC Pipe • HDPE Pipes • PPR Pipes

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SL NO	CAT 1 (CRITICAL)	CAT 2 (MAJOR)	CAT 3 (MINOR)
		Items with TPI/EIL inspection (@)	
1	• All process Compressor, pumps (with drive above 110 KW). • Diesel Generators Vessels (thickness more than 50 mm) and all Vessels with MOC NACE, alloy steel, clad steels, Inconel. • All Columns, Reactors, Heat Exchangers,	• All types of pumps, compressors excluding category 1 • Fans, blowers, Conveyors and material handling equipment's.Vessels (thickness less than 50 mm) and other vessels excluding category 1 • Trays and tower Internals • Burners for fired heaters • EOT/HOT crane • De super heaters & PRDS Air pre heaters, Damper, Soot blowers • Expansion joint ,Gas and Liquid Filters • Pipes /Piping material (flanges, fittings etc. AS, SS, clad steel, Inconel, NACE) • All types of valves All Fire Fighting equipment's, including Deluge valves LRM, Sprinklers. • FLM with fittings • HT/LT switch gear, Bus ducts • Fire alarm system • HV / LV Motors • DC System including consoles • PLC ,Batteries & battery Chargers, Capacitor banks • Plant communication system, UPS & Transformer • Variable speed drives • Tank level indicator/Instruments • All Control valves, pressure relief valves, breather valves • Meter-flow-annubar, Solenoid valve, Annunciators with panels, Self-actuating pressure control valves. • Temperature sensing Element RTD's • Thermowell and thermocouple • Mass flow meters , Pressure switches, Flow switches , Level switches (explosion Proof) • Flow sensing Element Orifice Plate & Flanges, Pitot Tube Analyzers - LEL Detectors, Level Instruments • Transmitters • Flame arrestors • Panel Control and accessories • All HV/HT and LV/LT cables and control cables. All types of flameproof fittings & fixtures.	• Hoists • Pipes & Piping materials (carbon steel & other) excluding category2 • Gauges Glass • Pressure gauges, Temperature Gauges, Draft Gauges. • Tape coat materials • Gratings • Insulation materials All fasteners, gaskets. • Hand railings

Note: For any material not covered above, the inspection requirement shall be decided by EIC based on the criticality.

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Format No: **G: 0 1 REV 0**

INCOMING MATERIAL INSPECTION REPORT

Report No. :
Date :

Project :
Contractor :
Work order No. :
:

Unit :
Consultant :
P.O. No. & Date :

Name of Work :
Job No. :
LR No. :

Sl. No.	SOR Item No.	Material description/Tag no	Date of Receipt	Qty. Received	Qty. Accepted	Manufacturer/ Vendor	MTC No./ IRN No. with Date/ Field, Lab test, etc.	Heat/ Batch No.	Ref. Invoice, Challan No., E-Way Bill (as applicable)	Observation/Remarks/ Storage Instruction

Notes :

INSPECTION ACTIVITY AT SITE (Tick as applicable)

1. Quantity verified and found in order ☐
2. Material condition appears to be good ☐
3. Heat/Batch/Tag No. mentioned on the material ☐
4. Color coding done as applicable ☐
5. Site identification mark on material ☐
6. Correlation w.r.t. IRN/MTC/Lab Tests report ☐
7. TC verification w.r.t. IRN/Spec/QAP, etc. ☐
8. Check for Vendor/Source approval ☐
9. Special Requirement if any. ☐

Based on above, materials are accepted.

Contractor Field Engineer
Name:

Contractor RCM/Site In charge
Name:

EIL Field Engineer

Name:

EIL Lead Engineer/Area coordinator/Spread In charge

Name:

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ATTACHMENT-II

उपस्कर एवं यंत्रों की स्थापना हेतु मानक विनिर्देश

STANDARD SPECIFICATION FOR ERECTION OF EQUIPMENT & MACHINERY

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
4	30.03.2019	Reaffirmed & Reissued	RJ	MI	RP	RKT
3	21.01.2013	Revised & Reissued	MA	RS	VK	DM
2	03.09.2008	Revised & Reissued	DM	PKR	AA	VC
1	30.05.2008	Revised & Reissued	DM	PKR	AA	VC
0	25.04.2001	Issued as Standard Specification	DM	AM	MR	MI

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Abbreviations:

ASME	:	American Society of Mechanical Engineers
EC	:	Erection Contractor
EIC	:	Engineer-in-charge
ELCB	:	Earth Leakage Circuit Breaker
GAD	:	General Arrangement Drawing
IS	:	Indian Standard
NDT	:	Non Destructive Testing
SS	:	Stainless Steel

General Engineering Standards Committee

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Members : Mr BR Bhogal (Elect.)
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1.0 SPECIFICATION FOR ERECTION OF EQUIPMENT AND MACHINERY

1.1 Scope

This specification covers technical requirements for erection of all static and rotating equipment by erection contractor at site. This specification is applicable for all the erection tenders operated by EIL.

1.2 General

1.2.1 All necessary handling equipments, tools, tackles and precision instruments for carrying out the works as specified shall be provided by the Erection Contractor (EC) at his cost. EC must provide all tools and gauges for erection and alignment. Special tools, if any, received as part of machinery, will be given to EC for erection purposes, which shall be returned in good condition after use. Suitable deductions will be made by the Engineer-in-Charge (EIC) in case of loss or damage of the special tools. The value of such loss or damage will be decided by the EIC and EC shall be bound by such a decision.

1.2.2 Equipment Manufacturer's recommendations regarding preservation during storage at site and detailed specifications for the installation alongwith layout drawings, general arrangement/equipment outline drawings and sub-assembly drawings of the various equipment and machinery will be provided to EC during the performance of work. The requirements stipulated in these shall be fulfilled by EC in addition to what is stated in this specification. Erection shall be carried out as per the instructions and supervision of Machinery manufacturer's representative, wherever such supervisory services are applicable.

1.2.3 All the items of work covered in the tender shall be carried out as per this Specification and other details to be furnished to EC. However, EIC reserves the right to give additional/alternative specifications and instructions, at any time, for execution of any particular work and EC shall execute such works in accordance with such additional/alternative specifications and instructions of the EIC. Such a step taken by the EIC shall not constitute a breach of the contract.

1.3 Preparation for Erection

1.3.1 EC shall be responsible for organising the lifting of the equipment in the proper sequence, so that orderly progress of the work is ensured and access routes for erecting the other equipment are kept open.

Rigging procedure for all the major lifts (above 10 MT) and at maximum crane capacity shall be submitted by EC for the approval of EIC. However, approval to rigging procedure proposed by EC shall not relieve EC from his responsibility in following the proper lifting/erection methods on ensuring orderly.

1.3.2 Orientation of all foundations, elevations, length and disposition of anchor bolts and diameter of holes in the supports saddles shall be checked by EC, well in advance. Minor rectifications including chipping of foundations as the case may be, shall be carried out by EC after obtaining prior approval of EIC. EC shall also be provided with the necessary structural drawings and piping layouts etc. wherever required for reference. EC shall crosscheck such piping and structural drawings with actual construction at site and in case of any mismatch inform the EIC before taking up the erection.

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1.3.3 During the performance of the work, EC shall keep structures, materials or equipments adequately braced by guys, struts or otherwise approved means which shall be supplied and installed by EC as required till the installation work is satisfactorily completed. Such 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.

2.0 ERECTION OF COLUMNS, TANKS, VESSELS AND DRUMS ETC.

2.1 Scope of work of Erection Contractor

(a) Preparation of erection scheme and rigging procedure and obtaining its approval from EIC wherever necessary.

(b) Withdrawal of equipments from Owner's storage point, checking and reporting its conditions, transporting the same to EC's stores of work site including unloading etc.

(c) Erection on foundations furnished by Owner including aligning, levelling and grouting.

(d) Assembly and fixing of demisters, grids, internal distributors and other internal fittings in Columns, Vessels etc.

(e) Filling of Columns, Reactors, Vessels/ Drums etc. with Raschig rings, supporting elements, sand, concrete etc. as required.

(f) Welding of washers for equipments, erection of pipe davit & minor welding of their parts as per specifications and instruction of EIC.

(g) Assembly & erection of Agitator (Mixer) along with drive unit (Motor) including all accessories for vessels/drums/reactors (wherever indicated) as per specification drawings & instructions of EIC.

(h) Flushing, cleaning and drying of Columns, Vessels/Drums etc.

(i) Completing the equipments in all respects for commissioning the plant as per drawings, specifications & instructions of EIC.

(j) Any modification in the erected Columns, Reactors, Vessels/Drums to the complete satisfaction of EIC.

2.2 General Conditions of Erection

2.2.1 Unless otherwise specified Columns, Vessels, Drums etc. will be generally supplied to the Erection Contractor in single piece and EC will not be required to carry out any assembly or welding. In case column is supplied in multiple pieces and erection of the equipment is not possible in single piece, EC shall be responsible for lifting the pieces, for aligning, welding and hydrotest etc. in vertical position under the supervision of column Supplier (Fabricator). However, EIC shall be responsible for coordination between Erection Contractor & Fabricator. The schedule of quantities (SOQ) for equipment erection enclosed with the tender document outlines details of each equipment such as diameter, overall height, type of support (saddle/skirt/leg/bracket), position (horizontal or vertical) and approximate erection weight etc. However the erection elevation and location of equipment shall be as per the piping layout drawing enclosed with the tender.

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2.2.2 Rigging procedures and erection schemes for all the heavy lifts weighing 10 MT & above shall be prepared by EC and got approved by EIC. Approval by EIC shall not relieve EC of his responsibilities. The details to be submitted will include the location of equipment from where it will be lifted, location of crane(s), details of crane(s) (like configuration, boom length, operating radius, boom point elevation, clearance underside the boom and the equipment, lifting capacity, counter weights to be deployed, holds on any neighbouring foundations, structures, equipments etc.), the load chart of the crane(s), design of the lifting tackles like spreader beam, D-shackles, wire rope slings etc. Unless the erection scheme and rigging procedures are approved by EIC, erection of such equipments shall not be undertaken in any case by EC.

2.2.3 Before starting the erection of Columns, Vessels etc., top surface of the foundations is to be cleared/chipped, roughened to obtain proper bond, while grouting. Also the sleeves are to be cleaned before erecting the equipments. Line (orientation) and levels are to be marked on all the foundations to facilitate checking of alignment.

EC shall also check the correct elevation and orientation of civil, structural foundations, before proceeding with the erection work. Discrepancy, if any, shall be brought to the notice of EIC. However, minor rectifications and chipping of foundations upto a thickness of 15 mm in foundation height shall be carried out at no extra cost, by the EC. EC shall be responsible for supply of levelling plates, (if required) and shall carry out levelling of equipment under the directions of EIC.

2.2.4 While handling, transporting or erecting the equipments, care shall be taken not to damage the nozzles, instrument connections, structural clips etc. EC shall also take care of the orientation of the nozzles and other connections of the equipments while erecting the same and ensure compliance with the drawings and specifications supplied. Discrepancy, if any, in the number/orientation of the nozzles, cleats etc. should be brought to the notice of the EIC before actual erection is started.

2.2.5 Verticality of the Columns, Reactors/Vessels shall be checked with theodolites. After erection the equipment shall be levelled and properly aligned with necessary shims and wedges supplied by EC, at his cost. After the level, alignment and verticality etc. are checked and approved by EIC, EC shall carry out grouting.

2.2.6 EC shall produce recent test certificates of the slings which they will be using for erection work. However, retesting of the slings shall be done at site by EC at his cost, as and when required by EIC. The weights of test loads shall be as per IS-807. The test loads shall be supplied by EC at his cost. Tested slings will be punched for test loads and date of testing as directed by EIC.

2.2.7 EC shall also carry out the assembly, erection, levelling and alignment of all types of weir plates, baffles, distributors, collectors, spray nozzles, demisters, grids and other internal fittings etc. Work shall be carried out as per manufacturer's standards/specifications which shall be made available to EC at the time of erection. Raschig rings, molecular sieves, intalax saddles packing and other types of tower packings such as sand, catalyst etc. and SS wire mesh shall be loaded into sections of Vessels, Columns as per specifications and drawings. Details for internals to be installed by EC shall be as per separate schedule of quantities enclosed with the tender document. All packings except clay and lime stone shall be washed with water before filling. Bottom layers, if required, shall be arranged as directed and random filling shall be done afterwards with equipment filled with water. Installation of packings, shall be done only after flushing and cleaning of Columns/Vessels and completed to the satisfaction of EIC.

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2.2.8 EC shall carry out minor welding for attachment of prefabricated pipe davit parts such as rain covers, handles etc. with pipe davit, during or after erection of the same as per the manufacturer's specifications, at no extra cost to the Owner.

2.2.9 EC shall execute erection of wooden pillow for saddle support for cold horizontal vessels wherever necessary as indicated on the drawings/ EIL STD 7-12-0003 and as per the instructions of EIC.

2.2.10 EC shall execute assembly & erection of agitator/mixer along with drive unit including all accessories as per supplier's instructions, specification drawings & instructions of EIC.

2.3 Flushing & Cleaning of Columns, Vessels, Drums etc.

2.3.1 After the erection, alignment and grouting of these equipments are complete, flushing and cleaning shall be carried out by EC as per specifications and instructions of EIC.

2.3.2 After flushing, cleaning and draining, equipments shall be dried by compressed air at the pressure and for duration decided by the EIC. The Vessel interior shall be thoroughly inspected to the complete satisfaction of EIC before it is finally boxed up. Boxing up of manholes and handholes shall be leak proof. All joints which need remaking, shall be remade. Compressed air for drying shall be arranged by EC.

2.4 Inspection and Acceptance Limits for Level and Alignment

2.4.1 Co-ordinates of foundations/supporting structures/mounting holes etc. shall be checked with respect to the plot plans by EC.

2.4.2 Before equipments are placed on foundations, orientations shall be checked with respect to piping drawings.

2.4.3 When equipments are firmly bolted down but prior to grouting, verticality of all the Columns, vertical vessels etc. shall be checked by using theodolite. Tolerances for equipment after erection shall be as per EIL Standard 7-12-0001. The allowable deviation from plumb line shall be 1 mm per metre height, subject to maximum of 15 mm unless otherwise stated on the drawings.

2.4.4 Horizontal Vessels shall be checked for level across machined face of nozzle flanges with precision level.

2.5 Additional requirements for Underground buried vessels

2.5.1 **Underground vessels for operating temp upto 60°C**

The vessels shall be supplied at site with one coat of inorganic zinc silicate primer duly applied on its external surfaces as per Spec. 6-79-0020. All other works such as application of coaltar enamel, as per EIL Spec. 6-79-0020 and wrapping and coating as per EIL Spec. 6-79-0011 shall be carried out by EC. This shall include necessary materials, tools and tackles to complete the Job in all respect as per the instructions of EIC.

2.5.2 **Underground Vessels for operating temp. Above 60°C and upto 300°C**

The vessels shall be supplied at site with one coat of inorganic zinc silicate primer as per Spec. 6-79-0020 duly applied on its external surfaces. EC shall be required to carryout touch-up and repair of outside primer before erection of equipment.

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2.5.3 EC shall do the necessary excavation, backfilling and removal of surplus earth at the site as per the directions of the EIC. EC's rate shall include the excavation, blast cleaning, painting, wrapping by kraft paper, placing and fixing of Vessels, backfilling and removal of excess earth.

3.0 ERECTION OF MECHANICAL EQUIPMENT

3.1 Scope of Work of Erection Contractor

The scope of EC shall consist of withdrawal and transportation of equipments and accessories from Owner's stores to site, assembly of loose supplied components/parts erection of equipment on foundations, levelling, aligning and grouting, preparation of equipments for trial runs and hand over in fit condition for the start up of the plant as per instructions of EIC.

3.2 Details of Owner Supplied Equipments

Equipments to be erected shall be supplied by the owner. Equipments may be supplied in any of the following conditions.

- Single equipment such as filter, static mixer, silencer etc.
- Skid mounted equipment, fully assembled.
- Skid mounted equipment with some items supplied loose or as subassemblies involving interconnections also.
- System comprising of many equipments, skids with interconnected piping & hook up.

3.3 Technical Requirements

3.3.1 All equipment/machinery erection shall be done by experienced fitters. For this purpose EC shall employ an experienced erection supervisor and crew who have done similar jobs.

3.3.2 EC shall study the layout drawings, for the machineries and equipments with their auxiliaries, controls defining scope of supply.

3.3.3 Equipments shall be checked for any damages as a result of transport, handling and defects, if any, shall be reported to the EIC. Rectification of defects shall be carried out in accordance with approved procedure.

3.3.4 Correct procedures for handling of equipment & installation on the foundation shall be followed as given in the manufacturer's manual. In case of non-availability of such procedures, EC shall develop & submit handling procedures for all equipment weighing more than 10 metric tonnes. The handling procedure shall be approved by the EIC.

3.3.5 EC shall check the correctness of equipment foundations or supporting structures as per the drawings. Equipment/Skid foot print dimensions shall be verified to match with the foundation. Minor chipping of foundation, pockets if required shall be carried out by EC.

3.3.6 All accessories like pressure gauges, seal oil, cooling water & Lube oil headers etc., shall be tagged and separately kept in Contractor's stores till erection. All flanged connections and openings shall be kept blanked with dummies, plugs to prevent entry of foreign particles.

3.3.7 Equipments shall be installed on the foundations in proper sequence. Incase the equipments are delivered in subassemblies, EC shall do the assembly work as per manufacturer's instructions.

3.3.8 Equipments shall be installed in the correct orientation and alignment.

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3.3.9 After installation and levelling the equipment shall be grouted with the specified grouting applied to the baseplate and support.

3.3.10 EC shall remove all the packing and protective devices used during transport and handling from the equipment such as shock absorbent materials from machined faces, blocking of shafts or rolling bearings & restraining devices from instruments, safety devices and protective equipments.

3.3.11 After the grouting is set & cured, the foundation bolts shall be checked to make sure that they are in straight and vertical position and properly tightened. Shims, if used, shall be on either side of the foundation bolts.

3.3.12 Desiccant, catalyst where supplied loose shall be loaded on to the respective vessels in specified quantities as per the suppliers instructions.

3.3.13 Internals, where supplied loose shall be assembled as per the drawings and manufacturer's instructions.

3.3.14 Unless otherwise specified, all the instruments such as pressure gauges, sight glasses temperature recorders etc. including instrument panels, if any, supplied along with the equipment with necessary connections, shall be installed by EC as part of Equipment erection.

3.3.15 Equipments shall be checked for final cleanliness before boxing up.

3.3.16 Any interconnected piping & ducting shall be properly installed and supported. EC shall connect the gas, steam, air, utility piping, instruments, oil piping etc. as per manufacturer's drawings, specifications and instructions of the EIC.

3.3.17 Safety devices shall be correctly installed.

3.3.18 Ladders, platforms, walkways shall be correctly installed with handrails, and flooring shall be properly secured.

3.3.19 Field welding, where specified shall be in accordance with the specified procedures and NDT tests where specified shall be carried out. Results of NDT tests shall be recorded.

3.3.20 Equipment alignment & couplings shall comply with tolerances specified in manufacturer's drawings and manuals. Provisions of dowel pins or similar arrangements for retaining the alignment shall be carried out.

3.3.21 After the piping has been connected, the alignment shall be checked by EC again, to ensure that piping connections do not induce any undue stresses on the Equipments. After making necessary corrections on the piping, if any, realignment shall be done by EC to ensure that no undue stresses are induced on the equipment.

3.3.22 Painting, insulation & fireproofing where specified shall be carried out in accordance with the applicable specifications attached in the tender document.

3.3.23 Any alterations, deviations made during equipment erection with respect to manufacturer's drawings or instructions shall be duly recorded and approval shall be taken from the EIC.

3.3.24 Any special tools, tackles supplied along with the equipment and used during installation shall be returned to the stores through the EIC.

3.3.25 Any protection of the equipment after installation, if required shall be carried out in accordance of the instructions of the EIC.

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3.4 Trial Runs

3.4.1 Wherever specified, Machinery & Equipment erected & installed by EC under the supervision of Machinery/Equipment supplier shall be subjected to trial runs in accordance with clause 5.4 of this specification. Job specific trial run procedure, if specified, supersedes the trial run procedure as described in clause 5.4.

3.5 System Start-up

During this phase of work, EC shall provide as part of his work necessary skilled personnel as per requirement of EIC. Any defects noticed in the Equipment shall be made good by EC at his cost if such defects are attributable to him.

4.0 HEAT AND MASS TRANSFER EQUIPMENT

This section covers the minimum requirements for erection of the following equipment by the EC.

- Deaerator
- Trays/ Tower Internals and Tower Packings
- Separators and Internals
- Shell and Tube Heat Exchangers
- Double Pipe Exchangers
- Electric Heaters
- Plate Exchangers
- Plate Fin Exchangers
- Sulphur Recovery Unit Equipment like Combustion Chambers, Waste Heat Boilers, Sulphur Condensers, Incinerators, Burners, Etc.
- Waste Heat Recovery Units
- Desalters
- Vacuum Ejectors
- Ejector Condensers

4.1 Scope of Work of Erection Contractor

4.1.1 Preparation of erection scheme and rigging procedure and obtaining its approval from EIC wherever necessary.

4.1.2 Withdrawal of equipment from Owner's storage point, checking and reporting its conditions, transporting the same to EC's stores and work site including unloading etc.

4.1.3 Preparation of foundation by chipping & installation of base plates for foundations. Minor rectifications & chipping of foundations up to a thickness of 15 mm due to error in foundation height, shall be carried out by the EC at no extra cost

4.1.4 Before starting the erection, top surface of the foundations are to be cleaned/chipped/roughened to obtain proper bond while grouting. Line (Orientation) & Levels are also to be marked on the respective foundations prior to erection to facilitate checking of alignment.

4.1.5 Supply of necessary shims, levelling plates, wedges, sliding base plate.

4.1.6 Erection on foundations furnished by Owner including aligning, levelling and grouting.

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4.1.7 Assembly and fixing of trays, tower internals (distributor, bed limiter, support plate, chimney trays, vapour distributor etc.), demisters, grids, internal distributors and other internal fittings in columns, vessels etc.

4.1.8 Installation of transformers on desalters and their electrical connection to electrode grid etc.

4.1.9 Welding of chimney trays, lattice girders, beams etc. wherever required.

4.1.10 Carrying out minor adjustments, modifications, seal welding of seal plates etc. wherever necessary during installation.

4.1.11 Checking of installed trays & tower internals and filling of installation formats as referred in 6-14-0016.

4.1.12 Filling of columns, vessels/drums etc. with Raschig rings/Pall rings/ Structured packing, as required.

4.1.13 Welding of washers for equipment, erection of pipe davit & minor welding of their parts as per specifications and instruction of EIC.

4.1.14 Hydrotesting of shell and tube heat exchangers if the time gap between last hydrotest is more than six months or in case it is found to be necessary by EIC. Procedure is given in para 4.3 & 4.4 below. EC to note that any equipment which are refractory lined at shop shall not be hydrotested.

4.1.15 Flushing, cleaning and drying of equipment using compressed air and blinding to prevent ingress of rain, dust etc.

4.1.16 Installation of refractory lining, brick lining, ceramic boards etc., as per specifications, recommendations of manufacturer and instructions of EIC.

4.1.17 Mounting of instruments like safety valves, rupture disks, sight glasses etc as required.

4.1.18 Completing the equipment in all respects for the commissioning of the plant as per drawings, specifications & instructions of EIC.

4.1.19 Any modification in the equipment to the complete satisfaction of EIC.

4.1.20 In addition to the above EC may be called upon to do other jobs like rectification of defects etc. as per instructions of EIC.

4.2 General Conditions of Erection

4.2.1 All carbon steel components of trays/tower internals shall be cleaned to remove rust preventive coating.

4.2.2 All welding shall be done by qualified welders only. The electrodes/filler material to be used shall be compatible with the metallurgy of component and shall be used only after prior approval of EIC.

4.2.3 A proposed Welding Procedure Specification (WPS) shall be submitted to EIL/ Owner's Inspector for his approval. On approval, a Procedure Qualification Test (PQT) shall be conducted which shall be witnessed by EIL/Owner's Inspector. On acceptance of all tests as per ASME Section IX, a final WPS along with Procedure Qualification Record (PQR) shall be submitted. Production welding shall start only after approval of final WPS/PQR and

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qualification of welders as per ASME Section IX. EIL/Owner's Inspector may accept previously qualified WPS/PQR at his sole discretion.

4.2.4 Lattice girders wherever provided for supporting tray & tower internals have been designed in such a way that various components pass through column manway. Components/parts of lattice girders are to be welded inside the column as per respective drawings. EC shall also ensure that all parts of lattice girder are properly welded & levelness of the lattice girder shall be checked before & after the welding. The limits of levelness as mentioned in GA drawings shall be adhered to.

4.2.5 The rigging procedure shall include the following as a minimum:

Location of equipment from where it will be lifted, location of crane(s), details of crane(s) (like configuration, boom length, operating radius, boom point elevation, clearance underside the boom and the equipment, lifting capacity, counter weights to be deployed, holds on any neighbouring foundations, structures, equipment etc.), the load chart of the crane(s), design of the lifting tackles like spreader beam, D-shackles, wire rope slings etc. Unless the erection scheme and rigging procedures are approved by the EIC, erection of equipment shall not be undertaken in any case by the EC.

4.2.6 While handling, transporting or erecting the equipment, care shall be taken not to damage the nozzles, instrument connections, structural clips, refractory lining etc. EC shall also take care of the orientation of the nozzles and other connections of the equipment while erecting the same and ensure compliance with the drawings and specifications supplied. Discrepancy, if any, in the number/orientation of the nozzles, cleats etc. should be brought to the notice of the EIC before actual erection is started.

4.2.7 After erection, the equipment shall be levelled and properly aligned with necessary shims and wedges supplied by EC, at his cost. After the level, alignment and verticality etc. are checked and approved by EIC, EC shall carry out grouting.

4.2.8 EC shall produce recent test certificates of the slings which they will be using for erection work. However, retesting of the slings shall be done at site by the EC at his cost, as and when required by the EIC. The weights of test loads shall be as per IS-807. The test loads shall be supplied by EC at his cost. Tested slings will be punched for test loads and date of testing as directed by EIC.

4.2.9 EC shall also carry out the assembly, erection, levelling and alignment of all types of weir plates, baffles, distributors, collectors, spray nozzles, demisters, grids and other internal fittings etc. Work shall be carried out as per manufacturer's standards/specifications which shall be made available to EC at the time of erection. Raschig rings/Pall rings/Structured packing, molecular sieves, intalox saddles packing and other types of tower packing such as sand, catalyst etc. and SS wire mesh shall be loaded into sections of vessels, columns as per specifications and drawings. Details for internals to be installed by EC shall be as per separate schedule of quantities enclosed with the tender document. All packing except clay and lime stone shall be washed with water before filling. Bottom layers, if required, shall be arranged as directed and random filling shall be done afterwards with equipment filled with water. Installation of packing, shall be done only after flushing and cleaning of columns/vessels and completed to the satisfaction of EIC.

4.2.10 EC shall carry out minor welding for attachment of prefabricated pipe davit parts such as rain covers, handles etc. with pipe davit, during or after erection of the same as per the manufacturer's specifications, at no extra cost to the Owner.

4.2.11 EC shall install base plate over the sliding end foundation before erection of shell and tube exchangers.

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4.2.12 Levelling and plumbness shall be approved by EIC and shall be checked using theodolite before grouting and final finishing of the foundations. The record of the same shall be maintained.

4.2.13 EC to ensure that shell and tube exchangers shall be firmly bolted down to foundations at the fixed end. Further EC to ensure that foundation bolts at the sliding saddle end are at the centre of slotted holes & nuts at sliding end are only hand tightened. Projected bolt threads shall be properly protected by application of grease etc. to avoid rusting and for facilitating free movement of nuts.

4.2.14 EC shall ensure that no equipment is subjected to any corrosion during any stage during his period of work till handling over to EIC/Client.

4.2.15 Instruments, as required, shall be mounted by EC. On instructions of EIC, EC shall also remove and hand over the instruments to EIC for calibrations. During this period, EC shall cover all openings to protect the equipment.

4.2.16 Before transportation to site, EC shall check and report to EIC on the condition of equipment, specifically highlighting the nitrogen pressure indicated in the nitrogen gauges and the absence of blinds on any of the nozzles.

4.2.17 In case the shell and tube exchangers are to be stacked, but have been stored as single shells at the store, then EC shall erect the bottom most shell, then erect other shell(s) sequentially using the nozzle gaskets/bolting and saddle bolting supplied by owner. Additional shims, if necessary, shall be supplied by EC. If the exchangers do not have interconnecting nozzles, then nozzle elevations shall be maintained as per piping GAD.

4.2.18 All equipment, consumable and other accessories required for completion of the job shall be arranged by the EC. This would include but not limited to cranes, tools and tackles, manpower etc; machinery for cutting, grinding , drilling etc. of base plates; instruments like dumpy level, plumb lines, Engineer's levels, precision levels, theodolite, straight edges etc. for checking the alignment/erection accuracy, hydrostatic testing pumps, potable water for hydrotesting, necessary materials including making the arrangements for hydro-testing, hoses, compressed air supply, pressure gauge, sealing taps, blinds, shims and wedges for alignment etc.

4.2.19 EC shall execute the erection of wooden pillows for saddle supports for cold equipment as indicated in schedule of quantities, EIL standard 7-12-002 and instructions of EIC.

4.2.20 For bought out items like plate exchangers, plate fin exchangers, electric heater, etc. vendor's instructions shall be followed.

4.2.21 For erection of piping of ejector system, EC shall follow relevant erection specification of piping for the project.

4.2.22 EC shall check the health of the equipment refractory lined at shop on receipt and shall report any defect or damage in the same to EIC. During installation all precautions shall be taken to avoid any damage to refractory lining. Any damage to refractory during erection shall be repaired by EC at his own cost without loss of time.

4.2.23 Wherever equipment with refractory are bolted or welded at the girth joints, the gaps between the refractory shall be suitably filled with ceramic fiber of suitable grade as given in the drawings or other relevant documents of the equipment.

4.2.24 Refer section 1.0 (General) for additional requirements.

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4.3 Hydrotesting of Shell and Tube Exchangers including Condensers

4.3.1 These shall hydrotested at site using potable water. Hydrotesting of both shell and tube sides shall be carried out as per procedure given below or as per instructions of EIC. For exchangers fitted with SS bellow or SS part, potable water with max. 25 ppm chlorides shall be used for hydrotesting.

4.3.2 Suitable pump set, piping, test pressure gauges and other instruments, water-hoses, temporary gaskets, metallic blinds, bolts, nuts, consumable and other temporary arrangements and equipment for testing shall be provided by the EC at his cost. Test pressure gauges shall be calibrated by the EC and got approved from EIC.

4.3.3 Stacked exchangers shall be hydrotested in stacked conditions.

4.3.4 Test pressure shall be as indicated in the name plates mounted on each exchangers. Duration of hydrotest shall be at least one hour. Test pressures and duration of hydrotest may be reduced by EIC. Minimum test water temperature shall be 20°C.

4.3.5 Any defects noticed during hydrotesting shall be repaired by EC as per the procedure approved by EIC. Cost for rectifying defects, not attributable to the EC shall be paid separately.

4.3.6 No equipment shall in general form part of the piping loop during hydrotesting and shall be blinded off, except when instructed otherwise by EIC.

4.3.7 EC to take adequate care during pressurising & depressurising the equipment. EC shall also take care of any instruction given regarding hydrotest in the exchanger drawing.

4.4 Hydrotesting Procedure

4.4.1 Shell side & tube side shall be hydrotested separately, unless specified otherwise. If both sides are to be tested together, a warning plate would be fixed to the exchanger, and the instructions given therein are to be followed.

4.4.2 The side, shell or tube which ever to be tested at higher pressure shall be taken first.

4.4.3 During hydrotest all gasket joints should be checked for any leakage. In case of leakage from any gasket joint, bolting at that joint shall be further tightened following proper tightening sequence (bolts should not be overtightened or tightened by hammering). In case it is not possible to stop leakage by bolt tightening, drain the water in exchanger & replace gasket at that joint by new gasket (gasket will be supplied by owner). After replacing gasket exchanger must be again hydrotested with same procedure to ensure leak tightness.

4.4.4 In case of floating head heat exchangers, if it is found during hydrotest that the pressure is dropping, while the external gasketed joints are not leaking, this could be due to floating head gasket joint leakage. This shall be further investigated, by removing shell cover & pressurising tube side to check the floating head gasket joint leakage. In case of leakage observed at floating head flange joint, replace floating head gasket by new gasket. After replacing gasket exchanger must be again hydrotested first on tube side & then on shell side with same procedure to ensure leak tightness of gasket joints.

In case of heat exchangers with shell side hydrotest pressure higher than tube side, it is possible that above procedure (with tube side hydrotest to detect floating head gasket leakage) may not help. Absence of leakage during this test is not conclusive in such a case, as the shell side pressure was dropping during hydrotest. In such a case, floating head gasket shall in any case be replaced and then equipment retested to ensure leak tightness.

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4.4.5 When hydrotested as per above procedure after floating head gasket replacement, if it is observed that test pressure is still dropping, this could mean leakage from tube to tubesheet joint. For such cases matter shall be reported to EIC for further investigations/instructions.

4.5 Flushing & Cleaning

4.5.1 After the erection, alignment and grouting of these equipment are complete, and after hydrotest if any, flushing and cleaning shall be carried out by EC as per specifications and instructions of the EIC.

4.5.2 After flushing, cleaning and draining, equipment shall be dried by compressed air at the pressure and for duration decided by EIC. The equipment interior shall be thoroughly inspected to the complete satisfaction of EIC before it is finally boxed up. Boxing up of manholes and handholes shall be leak proof. All joints which need remaking, shall be remade. Compressed air for drying shall be arranged by EC at his cost.

4.6 Inspection and Acceptance Limits for Level & Alignment

4.6.1 Co-ordinates of foundations/supporting structures/mounting holes etc. shall be checked with respect to the plot plans by EC.

4.6.2 Before equipment are placed on foundations, orientations shall be checked with respect to piping drawings.

4.6.3 When equipment are firmly bolted down but prior to grouting, verticality of all equipment shall be checked by using theodolite. Tolerances for equipment after erection shall be as per EIL Standard 7-12-0001. The allowable deviation from plumb line shall be 1 mm per metre height, subject to maximum of 6 mm.

4.6.4 Horizontal equipment shall be checked for level across machined face of nozzle flanges with precision level.

4.6.5 Difference in elevation of centerline from one end to the other end shall not be more than 1 mm per meter and limited to ± 3 mm maximum. Further elevation difference shall be such as to ensure complete draining of equipment.

4.6.6 Survey of column inside and checking the levelness of support rings, location of bolting bars to ensure that the same are as per column drawings and within tolerances specified in standard 7-14-0001. In case these are not within permissible tolerances, the same shall be reported to EIC for necessary rectification/modification.

4.7 Safety, Health & Environment

EC shall install an exhaust fan for exhaling welding/ cutting fumes etc. and to maintain adequate oxygen level, before any work is started inside confined spaces (i.e. columns). Adequate ventilation shall be maintained at all times. Gas/LPG cylinders shall not be taken inside confined space. When a worker/supervisor enters a confined space, it shall be mandatory to have a second man as standby. Safety belts shall be worn while entering columns, if there is a danger of falling. All ladders/stair cases shall be in place before any item is offered to owner's inspectors. Rope ladders/scaffolding shall be provided inside the column in case tower internals are not easily approachable from column manhole. Low voltage (24 V) lamps equipped with guards shall be used to prevent accidental contact with bulb. All electrical connections shall be through ELCB's and proper earthing shall be ensured. Acids and other materials used for pickling shall be disposed off to a designated place as directed by owner/EIL. All statutory Regulations and owner's safety, health and environment requirements

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shall be complied with. Inspection aids for carrying out the inspection of internals shall also be provided.

5.0 ERECTION OF ROTATING EQUIPMENT

5.1 Scope of Work of Erection Contractor

The scope of work shall consist of transportation of Rotating Equipments and accessories from Owner's stores to site, assembly of sub-assemblies/parts, erection of Rotating Equipments on foundations, levelling, aligning and grouting, preparation of Rotating Equipments for trial runs, carrying out no load/trial runs, return of any unused material to the owners stores and hand over in fit condition for the start- up of the Plant, as per instructions of EIC.

Defects due to EC's fault noticed during trial runs shall be rectified by him. Schedule of Quantities, indicate estimated numbers, dimensions and weights of the Rotating Equipments. The actual data on dimensions and weights will be in the vendor data manuals.

The term 'Rotating Equipment' includes all pumps, compressors, steam & gas turbines, fans and blowers, diesel engine/steam turbine/gas turbine generator sets along with drivers accessories & auxiliary systems.

5.2 General Conditions of Erection

5.2.1 All Rotating Equipment erection shall be done by experienced fitters. For this purpose EC shall employ experienced and suitably qualified erection supervisor and crew who have done similar jobs.

5.2.2 The Rotating Equipment manufacturer's instructions as available regarding installation and trial runs will be passed on to EC during the course of work. The requirements prescribed therein shall be met in addition to what is stated in this specification. Erection shall be carried out as per instructions of the Rotating Equipment manufacturer's representative and under their supervision whenever the manufacturer is present at site. In all other cases instructions of the EIC, regarding procedure/sequence of erection shall be binding on EC.

5.2.3 For all Rotating Equipment, EC shall follow the proper sequence for assembly and erection. For Rotating Equipment received along with driver in coupled condition, the coupling bolts shall be dismantled by EC, and alignment shall be rechecked. Realignment, if required, shall be done before recoupling.

Where drivers and couplings are provided separately, drilling and tapping of holes in the base plates for fixing drivers, fixing of couplings on shafts, after enlarging the pilot bores to the correct size with key way etc. and dowelling including provision of dowel pins, alignment screws, jack-up screws or similar arrangements for retaining the alignment shall be carried out by EC as part of erection work. Shims & wedges as required for alignment shall be supplied by EC.

5.2.4 Process and utility (such as cooling water, steam flushing, quenching, lubricating oil, sealing etc.) connections connected with rotating equipment and its auxiliaries shall be fabricated and/or installed by EC from materials supplied by the Owner as per drawings, specifications and instructions of the EIC.

5.2.5 Piping and accessories supplied with the rotating equipment such as seal oil/Gas system, cooling water system & Lube oil system etc. shall be tagged separately and kept in EC's stores till erection. All flanged connections and openings shall be kept blanked with dummies/plugs to prevent entry of foreign matter.

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5.2.6 The local mounted instruments such as pressure gauges, sight glasses, temperature gauges etc. and Local instrument panels, if any, with necessary connections, shall be installed by EC as part of rotating equipment erection.

5.2.7 After initial alignment, the Rotating Equipments shall be properly grouted. Grouting shall be carried out as per this specification. Wherever grout holes are provides in the base plates, grout shall be filled through them also.

Epoxy grout where recommended by the rotating equipment manufacturer, shall be provided by EC and shall be as specified in this standard.

5.2.8 Alignment between the Driver and driven equipment shall be done without connecting the equipment nozzles to respective piping. After completion of alignment, the equipment shall be connected to Piping. After the piping has been connected, the alignment shall be re-checked by EC, to ensure that piping connections do not induce any undue stresses on the Rotating Equipments. After making necessary corrections on the piping, if any, re-alignment shall be done by EC and he will ensure that no undue stresses are induced on the Rotating Equipment.

5.3 Special Instructions

EC in addition to general instructions for erection as out lined in para 5.2 above, shall also follow the following special instructions.

5.3.1 Pumps

Depending upon the size of equipment, Pump train will be supplied for erection in any of the following modes :

(a) Pumps with drivers and accessories fully assembled on a common skid (Base plate).

(b) Pumps mounted on base plate and couplings and driver supplied loose in separate packs.

(c) Various major components such as pump, drivers, couplings, gear boxes & base plates auxiliary systems like lube, seal flush equipment in separate packs.

5.3.2 Reciprocating Type Compressors

5.3.2.1 Reciprocating compressors may be supplied for erection in knocked down condition in multiple packaged subassemblies such as frame assembly, distance pieces, fly wheels, cylinder block assemblies, valve assemblies etc. and other accessories such as, drivers, couplings, gear boxes (if any), control panels, gauge boards, coolers, lube oil systems, cooling water systems, etc. would be in separate packages.

Besides the above there would be other packages for loose supplied items such as instruments, pre-fabricated piping, and piping/tubing in commercial lengths.

Lifting devices for erection shall be arranged by EC depending on the weight of packages and elevation of installation.

5.3.2.2 In case of Rotating Equipments received in knocked down condition, the various parts shall be assembled as per instructions of the EIC and as per manufacturer's instructions. All parts of the Compressor shall be thoroughly cleaned with solvents to remove protective compounds if any, before assembly.

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5.3.2.3 The compressor, driver and other accessories shall be erected on their respective foundations and the compressor, couplings, gear box and driver shall be aligned and grouted as per the manufacturer's instructions and instructions of EIC and the manufacturers supervisor (when present). There-after all process and utility, drain & vent connections shall be completed as per the relevant drawings/instructions of equipment manufacturer and advice of EIC.

5.3.2.4 Final alignment shall be done after all the piping connections such as water, steam, drains and connection to coolers etc. are made. Tolerances for alignment shall be maintained as specified in the Manufacturer's Instruction Manual. To ensure that piping connections do not induce any undue stresses on the Rotating Equipment, the alignment shall be checked once again by EC after the piping has been connected. Any correction necessary for proper alignment shall be done by EC.

5.3.2.5 EC shall carefully study the vendor drawings, manuals and other data before start of the job to ensure correct erection, alignment and commissioning.

5.3.3 **Centrifugal Compressors & Expanders**

5.3.3.1 Centrifugal Compressors are supplied for erection in multiple packages such as,

- Compressor casings
- Drivers (Electrical motors, Steam/Gas turbines -♦)
  {♦ : Steam/Gas turbines would be further supplied in multiple packages}
- Base plates (or skids)
- Lube oil/control oil systems
- Sealing systems
- Air filters (for gas turbines & compressors for air service)
- Temporary strainers
- Couplings
- Gear boxes
- Coolers
- Gauge boards
- Control panels
- Lube & Seal Oil tanks
- Fire systems (for gas turbines)
- Condensers (for steam turbines)
- Condensate systems (for steam turbines)
- Loose supply items
- Pre-fabricated & Commercial lengths piping, tubing.
- Other miscellaneous packages

5.3.3.2 Other requirements shall be same as defined in para's 5.3.2.2 to 5.3.2.5 above.

5.4 Trial Runs of Machinery

5.4.1 Any construction defects shall be intimated to EIC before start-up. All protective and safety guards shall be installed and rotating equipment shall be checked for free movement by manual barring over. All foundation bolts and alignment shall be checked before starting the trial runs, if damaged, rotating equipment may have to be opened and repaired as directed by EIC. Prior to carrying out the trial runs, the rotating equipment will be subjected to necessary checks by the EIC and the trial runs shall be commenced only after the approval of the EIC.

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5.4.2 Unless otherwise specified, all the rotating equipment will be subjected to trial runs for a continuous operation of 72 hours. In case of motor driven rotating equipments, motors shall be decoupled and turned over to other agencies doing electrical work for testing and no load running of motors. After the no load runs of motors are satisfactorily completed, EC shall recouple the motors to the rotating equipment and recheck the alignment. The trial run of the rotating equipment shall be started only after the above is completed. EC shall provide, as part of his work, necessary skilled personnel (excluding the operating personnel) for conducting the trial runs round the clock during the trial runs period. The duration of trial run may be extended if it is considered necessary in the opinion of EIC and EC shall provide personnel for such extended period also. Final inspection of bearing etc. shall be carried out by EC after the Machinery had gone through the trial run and defects, if any, shall be made good for rendering the rotating equipment ready for start up.

5.4.3 During the trial runs, readings of bearing temperature, cooling water inlet and outlet temperatures, lube oil inlet/outlet temperature and pressure, rotating equipment discharge pressure and temperature, starting in current, no load/full load current etc. shall be recorded, wherever necessary, by EC. Trial reports shall be prepared in the approved proforma by EC containing all the above details and submitted to the EIC as part of completion documents.

5.4.4 EC shall also provide necessary improvised fencing and watch & ward personnel as safety measures during trial runs.

5.5 System Start up

During start-up, EC shall provide necessary skilled personnel as per requirement of EIC, to rectify defects noticed in the rotating equipment, if such defects are attributed to him.

6.0 EQUIPMENT GROUTING

All anchor bolt sleeves/pockets and space under Base plates/machine base frames/shoe plates, etc. shall be grouted with either free flow non shrink cementitious or epoxy grout as per the following categorisation:

Sr. No.	Type of Grout	Application
1	Non shrink cementitious grout	All static and rotating equipments, unless covered in 2) below, viz Static equipments like tall columns, vertical silo, blender etc. and horizontal vessel, drum, sphere, bullets, filter, heat exchangers, coolers etc. and other similar equipments, steel stack/chimney, furnace etc. Low frequency, medium frequency, high frequency rotating machines like compressors (centrifugal, reciprocating, diaphram, screw, gear type etc.). Induced draft fan, forced draft fan, air blowers, pumps (centrifugal, reciprocating, diaphram, gear type etc.), expanders, turbine, generator, diesel generator, air coolers (fin fan cooler) and other similar equipment. Machine like screen vibrator, extractor, centrifuge pulverizer, dryer, drop hammer, ball mill, crushers, bagging machine and general workshop equipment.
2	Epoxy grout	Specifically if requested by the Machine Vendor.

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6.1 Grout (Material)

All material used for grout shall be in EC's scope. Only approved grout material shall be used. EC shall submit details of grout materials for prior approval of EIC.

6.1.1 Non-Shrink Grout

Non-shrink grout shall be premix type of cementitious (cement pregraded fibre and additive) non-shrink, ready to use grout in dry powder form. It shall have free flow property when mixed with required quantity of water. It shall have initial setting time of 30 minutes.

It shall have the following features:

- Non corrosive to anchor bolts, base plate/saddle/frame, sliding plate.
- Not harmful to concrete and reinforcing steel.
- Non toxic
- Frost, oil and fire resistant
- Require normal curing
- Suitable to use under restraints and grout thickness required
- Expansive to counteract initial shrinkage
- Ensure high early strength without surface crack.
- Suitable for temperature of above 0 deg.C to 200 deg.C.
- Maximum flow distance is compatible to the dimensions of base plate/ saddle/frame.
- It should be resisted to the chemicals, gases etc. being handled in equipment/machines.

It should have the following physical properties:

-	Min. Compressive strength at	3 days	25 N/mm^2
		7 days	30 N/mm^2
		28 days	40 N/mm^2
-	Min. Tensile strength at	28 days	3.5 N/mm^2
-	Min. Bond strength at	7 days	12 N/mm^2
-	Max. Onstrained Expansion in	2 hours	4%
-	Min. Density		2000 kg/m^3

6.1.2 Epoxy Grout

Epoxy grout shall consist of epoxy resin base, hardener and filler component like graded and blended aggregate. Components of epoxy grout shall be of desired grade and mixed in proportion recommended by manufacturer such that it is injectable under base plate/frame/saddle etc., has low viscosity to meet the flow distances according to dimensions of base plate saddle/frame, it is suitable for the desired thickness, it is homogenous, free from segregation, attains high early and high final strength. It shall have minimum Pot life of 30 minutes. It shall have all the features as specified in clause 6.1.1 except for expansive properties.

It should have the following physical properties :

-	Min. compressive strength at	1 day	75 N/mm^2
		7 days	85 N/mm^2
-	Min. Flexural strength	7 days	25 N/mm^2

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6.2 Grouting (Placement)

6.2.1 Surface Preparation

Prior to positioning of equipment/machine etc. over concrete pedestal, foundation, slab, beam, etc. all laitance & loose material shall be removed by wire brushing & chipping. The bearing concrete surface shall be sufficiently levelled, hacked with flat chisels to make it rough, clean (using compressed air). Additional chipping, if required, to suit level of base plate and/or minimum thickness of grout shall also be done. In case of use of cementitious grout surface shall be thoroughly wet. All pockets for anchor bolts shall also be similarly cleaned. Any excess water shall be removed. In case of use of epoxy grout, it shall be ensured that surface/pocket to receive grout is totally dry. After erection, alignment/plumbing of equipment/machine in required level, orientation and plumb and installation of sliding plate. Forms shall be constructed around and joints made tight to prevent leakage of the grout.

6.2.2 Preparation of Grout

6.2.2.1 In case of premix type of grout water shall be added in required quantity as specified by supplier and/or EIC. Any specific instruction of manufacturer will be strictly followed.

6.2.2.2 In case of epoxy grout required quantity of all constituents shall be mixed in proportion recommended by manufacturer/supplier and/or EIC. All specific requirements of manufacturer/ supplier shall be strictly followed.

6.2.2.3 Required quantity of grout shall be made considering initial setting/pot life of grout. Any grout not used within initial setting time/pot life shall be rejected and in no case used for grouting.

6.2.3 Placement of Grout

6.2.3.1 Placing of grout shall be taken up only after level, orientation, alignment of equipment/machine has been approved by EIC and anchor bolts are placed in pocket.

6.2.3.2 In case of epoxy grout EC shall give details of grouting scheme and get approval of EIC.

6.2.3.3 The grout mixture shall be poured/injected continuously (without interruption till completion) by grouting pump/injecting gun from one side of base plate and spread uniformly with flexible steel strip and rammed with rods till the space is filled solidly and grout mixture carried to the other side of base plate and fill all pockets. Any specific requirement of manufacturer/ supplier shall be strictly followed. Epoxy grout shall be done by or under supervision of manufacturer/supplier and/or agency having adequate experience in this field as per direction of EIC.

Total work shall be done under supervision and direction of EIC and care shall be taken that alignment of equipment/machine is not disturbed.

6.2.3.4 Grout mixture shall be allowed to harden for a period of minimum 7 days or as required by manufacturer/supplier of grout and/or as decided by EIC. At the end of this period, the shims/edges/pack plate may be removed and anchor bolts tightened uniformly. Alignment of equipment/machine shall be rechecked and if found correct, the voids left by the removal of shims/wedges/pack plate (if removed) must be filled up with a similar mixture of grout. In case after checking, serious misalignment is indicated, the grout shall be removed completely and fresh grouting is done after making appropriate correction of alignment.

6.2.3.5 Minimum thickness of grout shall be 25mm for all types of grout and maximum thickness shall be 40mm for non-shrink grout. For epoxy grout the maximum thickness shall be as per manufacturer's recommendation and/or as specified in drawing.

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7.0 REFERENCE EIL STANDARDS/ SPECIFICATIONS

6-14-0003	Installation Procedure for Trays & Tower Internals
6-14-0011	Specification for Packing the Column
6-14-0016	Standard Specification for Review of Site Installation of Column Internals.
6-79-0011	Standard Specification for Corrosion Protection Tape Coating for Underground Steel Piping.
6-79-0020	Standard Specification for Surface Preparation and Protective Coating (New Construction)
7-12-0001	Vessel Tolerances.
7-12-0002	Support for Horizontal Vessel
7-12-0003	Wooden Pillow for Saddle Support
7-12-0004	Skirt Base Details
7-12-0024	Lifting Lug Top Head Type
7-14-0001	Construction Tolerance for Welded Supports for Tray / Tower Internals

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ATTACHMENT-III

<table>
<tr><td colspan="2">OBSERVATION ON QUALITY ASPECTS</td></tr>
<tr><td colspan="2">Job No: Name of Work: No:
FOI/LOA No:
Issued To : M/s Date of Issue:</td></tr>
<tr><td colspan="2">Location Of Work:
Item Of Work:</td></tr>
<tr><td rowspan="2">Details Of Observation(Deficiency)</td><td>Recommended Course Of Action</td></tr>
<tr><td>Time Allowed For Correction</td></tr>
<tr><td>Issued By:
Name :
Designation:
Signature:</td><td>Received by:
Name:
Signature:
Date and Time:</td></tr>
<tr><td colspan="2">Corrective Action Report By Contractor/Vendor:

Date: Name
Signature:</td></tr>
<tr><td colspan="2">Distribution Before Resolution:
RCM/ Area Coordinator /QA Mgr:</td></tr>
<tr><td colspan="2">Verification Of Resolution By Issuer/Area Coordinator/RCM(EIL):

Date: Name:
Signature:</td></tr>
<tr><td colspan="2">Distribution After Resolution:
RCM/ Area Coordinator /QA Mgr:</td></tr>
</table>

ATTACHMENT-IV

OBSERVATION ON SAFETY ASPECTS	
Job No: Name of Work: No: FOI/LOANo: Issued To : M/s Date of issue:	
Location Of Work: Item Of Work:	
Details Of Lapses/Shortfalls/Hazards Identified	Recommended Course Of Action Suspension of work required till resolution. (Yes/No) Time Allowed For Correction:
Issued By: Name : Designation: Signature:	Received by: Name: Signature: Date and Time:
Corrective Action Report By Contractor/Vendor: Date: Name And Signature:	
Distribution Before Resolution: RCM/ Area Coordinator/QA Mgr :	
Verification Of Resolution By Issuer/Area Coordinator/RCM (EIL): Date: Name: Signature:	
Distribution After Resolution: : RCM/ Area Coordinator /QA Mgr:	

TECHNICAL COMPLIANCE FORMAT (CONSTRUCTION)

SETTING UP LABORATORY & ASSOCIATED SERVICES OF PP PLANT- BPCL KOCHI

PROJECT : SETTING UP LABORATORY & ASSOCIATED SERVICES FOR PP PLANT-BPCL KOCHI

OWNER : BPCL-KOCHI

PMC : ENGINEERS INDIA LTD

JOB No. : B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	30.10.2025	ISSUED FOR BIDS	BC	AC	HOD(C)

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Bidder must furnish answers/clarifications/confirmations of all the following queries and submit along with offer.

SL. NO.	COMMENT/QUERY	BIDDER'S CONFIRMATION/ANSWER
1.	Bidder to confirm that requirement of Health, Safety and Environment (HSE) as per specification no: 6-82-0001 are taken into consideration.	
2.	Bidder to confirm that required construction equipments to meet the contract schedule shall be mobilized by him without any time & cost implications.	
3.	Bidder to confirm that required construction personnel for supervision to meet the contract schedule shall be deployed by him meeting the requirement of qualification and experience (refer Doc. No 7-82-0003 in this regard) without any time & cost implications.	
4.	Bidder to confirm that Construction Management of this job shall be done by him and shall not be sub-contracted to any other agency.	

Bidder's Signature and Stamp	

निर्माण स्थल पर स्वास्थ्य, सुरक्षा एवं पर्यावरण प्रबंधन हेतु मानक विनिर्देश

STANDARD SPECIFICATION FOR HEALTH, SAFETY & ENVIRONMENTAL MANAGEMENT AT CONSTRUCTION SITES

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	18/04/2023	REVISED & UPDATED	BT	RK	JPV	SM
1	07/06/2022	REVISED & UPDATED	BT	RK	JPV	SM
0	23/12/2020	REVISED & UPDATED	BT	RK	AKK	S Mazumdar

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Abbreviations:

AERB	:	Atomic Energy Regulatory Board
ANSI	:	American National Standards Institute
BARC	:	Bhabha Atomic Research Centre
BS	:	British Standard
BOCW	:	Building and other construction workers
BOO/BOOT	:	Build, Own, Operate/Build, Own, Operate, Transfer
EIL	:	Engineers India Limited
EIC	:	Engineer In charge
ELCB	:	Earth Leakage Circuit Breaker
EPC	:	Engineering, Procurement and Construction
EPCC	:	Engineering, Procurement, Construction and Commissioning
ESI	:	Employee State Insurance
GCC	:	General Conditions of Contract
GM	:	General Manager
GTAW	:	Gas Tungsten Arc Welding
HOD	:	Head of Department
HSE	:	Health, Safety & Environment
HIRAC	:	Hazard, Identification Risk Assessment & Control
HMV	:	Heavy Motor Vehicle
HV	:	High Voltage
IS	:	Indian Standard
ISO	:	International Organization for Standardization
IE	:	Indian Electricity
LTI	:	Lost Time Injuries
LMV	:	Light Motor Vehicle
LOTO	:	Lock Out & Tag Out
LPG	:	Liquefied Petroleum Gas
LSTK	:	Lump Sum Turn Key
MV	:	Medium Voltage
OH&S	:	Occupational Health and Safety
OISD	:	Oil Industry Safety Directorate
PPE	:	Personal Protective Equipment
PUC	:	Pollution Under Control
RC	:	Registration Certificate
RCCB	:	Residual Current Circuit Breaker
RCM	:	Resident Construction Manager or Site-in-Charge, as applicable
SCC	:	Special Conditions of Contract
SLI	:	Safe Load Indicator
SWL	:	Safe Working Load
TPI	:	Third Party Inspection
TBT	:	Tool Box Talks

Construction Standards Committee

Convenor: Sh John Paul V, ED(Construction)

Members: Sh.Janak Kishore, ED (Projects)
Sh.Biswajit Mandal, CGM (SCM)
Sh. Udayan Chakravarty, Sr.GM (Piping)
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Sh. Pankaj Kumar Rai, DGM (Construction)

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Attachments (Reporting Formats)

I	Safety Walk through Report	HSE-1 Rev.1
II	Accident/Incident Report	HSE-2 Rev.0
III	Suppl. Accident/Incident Investigation Report	HSE-3 Rev.0
IV	Near Miss Incident Report/Dangerous Occurrence	HSE-4 Rev.0
V	Monthly HSE Report	HSE-5 Rev.0
VI	Permit for Working at Height	HSE-6 Rev.1
VII	Permit for Working in Confined Space	HSE-7 Rev.1
VIII	Permit for Radiation work	HSE-8 Rev.0
IX.	Permit for Demolishing/ Dismantling	HSE-9 Rev.1
X	Daily Safety Checklist	HSE-10 Rev.0
XI	Housekeeping Assessment & Compliance	HSE-11 Rev.0
XII	Inspection of Temporary Electrical Booth/ Installation	HSE-12 Rev.0
XIII	Inspection for Scaffolding	HSE-13 Rev.0
XIV	Permit for Erection / Modification & Dismantling of Scaffolding	HSE-14 Rev.1
XV	Permit for Heavy Lift/Critical Erection	HSE-15 Rev.1
XVI	Permit Energy Isolation & De-Isolation	HSE-16 Rev 1
XVII	Permit for Excavation	HSE-17 Rev 1
XVIII	Environmental Aspect Impact Register	HSE-18 Rev 0
XIX	HIRAC Register	HSE-19 Rev 0
XX	Checklist for Tower Crane	HSE-20 Rev 0
XXI	Crane Inspection Checklist	HSE-21 Rev 0
XXII	Hydraulic Mobile Crane Inspection Checklist	HSE-22 Rev 0
XXIII	Hydraulic Rig Inspection Checklist	HSE-23 Rev 0
XXIV	Boom Lift Inspection Checklist	HSE-24 Rev 0

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1.0 SCOPE

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied by Contractors/Vendors including their sub-contractors/sub vendors during construction.

This specification is not intended to replace the necessary professional judgment needed to design & implement an effective HSE system for construction activities and the contractor is expected to fulfill HSE requirements in this specification as a minimum. It is expected that contractor shall implement best HSE practices beyond whatever are mentioned in this specification.

Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act(s)/ Legislations, General Conditions of Contract (GCC), Special Conditions of Contract (SCC) and Job (Technical) Specifications. Where different documents stipulate different requirements, the most stringent shall apply.

2.0 REFERENCES

The document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers Act, (Refer Appendix-D)
- Indian Factories Act,(Refer Appendix-D)
- Job (Technical) specifications
- Relevant International/ National Codes (refer Appendix-A for standards/codes on HSE)
- Relevant State & National Statutory requirements.
- Operating Manuals Recommendation of Manufacturer of various construction Machineries
- Occupation Health and Safety Management System (OHSAS 18001:2007/ISO 45001) and Environmental Management System (ISO 14001:2015)

3.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENTAL (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS

3.1 Management Responsibility

3.1.1 HSE Policy & Objectives

The Contractor should have a documented and duly approved HSE policy &objectives to demonstrate commitment of their organization to ensure health, safety and environmental aspects in their line of operations.
The Contractor's senior management shall provide strong visible leadership and continuously demonstrate commitment to develop, operate and maintain, review and continually improve a HSE culture at site which empowers individuals to take responsibility for their safety and embrace and accept nothing but responsible HSE behaviour.
Contractor shall refer in clause No. 3.3.23 for Key Performance Indicator (KPI).

3.1.2 Management System

The HSE management system of the Contractor shall cover the HSE requirements & commitments to fulfill them, including but not limited to what have been specified under clauses 1.0 and 2.0 above. The Contractor shall obtain the approval of its site specific HSE Plan from EIL/ Owner prior to commencement of any site works. Corporate as well as Site management of the Contractor shall ensure compliance of their HSE Plan at work sites in its entirety in true spirit.

3.1.3 Indemnification

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Contractor shall indemnify & hold harmless, Owner/EIL & their representatives, free from any and all liabilities arising out of non-fulfillment of HSE requirements or its consequences.

3.1.4 **Deployment &Qualifications of Safety Personnel**

The Contractor shall designate/deploy various categories of HSE personnel at site as indicated below insufficient number. In no case, deployment of safety Supervisor / Safety Steward shall substitute deployment of Safety Officer / Safety Engineer what is indicated in relevant statute of BOCW Act i.e. deployment of safety officer/Safety Engineer is compulsory at project site. The Safety supervisors, Safety stewards/Observer etc. would facilitate the HSE tasks at grass root level for construction sites and shall assist Safety Officer /Engineers.

Contractor shall appoint safety personnel as given below for every work shift:

(i) Safety Observer/Steward: Contractor shall depute one Safety Observer/Steward for every 100 workers or part thereof

(ii) Safety Supervisor: In addition to above(i), contractor shall depute one Safety Supervisor for every 250 workers or part thereof

(iii) Safety Engineer: In addition to above (i&ii), one safety engineer/ officer for every 1000 workers or part thereof.

Contractor shall intimate/obtain prior permission from EIC before demobilizing any safety personnel. The Contractor shall mobilize suitable safety personnel as replacement.

a) Safety Steward/Observer

As a minimum, he shall possess class XII pass certificate and trained in fire-fighting as well as in safety/occupational health related subjects, with minimum two year of practical experience in construction work environment and should have adequate knowledge of the local language spoken by majority of the workers at the construction site.

b) Safety Supervisor

As a minimum, he shall possess a recognized graduation Degree in Science (with Physics & Chemistry) or a Diploma in Engg. Or Tech. with minimum Two years of practical experience in construction work environment and should possess requisite skills to deal with construction safety & fire related day-to-day issues.

c) Safety Officer / Safety Engineer

Safety Officer/Engineer should possess following qualification & experience:

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(i) Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, **or** possessing recognized diploma in any branch of Engg. or Tech with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than five years.

(ii) Recognized degree or one year diploma in Industrial safety(from any Indian Institutes recognized by AICTE or State Council of Tech. Education of any Indian State/Union territory) with at least one paper in construction safety (as an elective subject).

(iii) Preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

Alternately

(i) Person possessing Graduation Degree in Science with Physics **or** Chemistry and degree or one year diploma in Industrial Safety (from any Indian institutes recognized by AICTE or State Council of Tech. Education of any Indian State/ Union Territory) with practical experience of working in a building, plant or other construction works (as Safety Officer, in line with Indian Factories Act, 1948) for a period of not less than five years, may be considered as Safety Officer.

d) HSE In-Charge

In case there is more than one Safety Officer at any project construction site, one of them, who is senior most by experience (in HSE discipline), may be designated as HSE In-Charge. Duties & responsibilities of such person shall be commensurate with that of relevant statute and primarily to coordinate with top management of EIL/Client and contractors.

In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act,1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above clarifications, the same shall be followed.

Contractors shall ensure physical availability of safety personnel at the place of specific work location, where Hot Work Permit is required/granted. No work shall be started at any of the project sites until above safety personnel & concerned Site Engineer of Contractor are physically deployed at site. The Contractor shall submit a HSE Organogram clearly indicating the lines of responsibility and reporting system and elaborate the responsibilities of safety personnel in their HSE Plan.

Upon fulfilling the basic requirement of qualification and relevant experiences, the performance of contractor HSE personnel's is to be monitored.

The good performing contractor's HSE personnel at site shall be rewarded upon assessment of performance by EIL/Owner. The non-performing HSE personnel shall be counselled by EIL/Owner & suitable action may be taken for suspension from site for 3-6 days. Contractor shall arrange training for non performing HSE personnel.

HSE In –Charge of the contractor shall be given the status at par with the other heads of department and shall report to Head of Project.

The Contractor shall verify & authenticate credentials of such safety personnel and furnish Bio-Data/Resume/Curriculum Vitae of the safety personnel as above for EIL/Owner's approval, at least 1 month before the mobilization. The Contractor, whenever required, shall arrange submission of original testimonials/certificates of their Safety personnel, to EIL/Owner (for verification/scrutiny, etc.)

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Imposition/ Realization of penalty shall not absolve the Contractor from his/her responsibility of deploying competent safety officer at site.

Adequate planning and deployment of safety personnel shall be ensured by the Contractor so that field activities do not get affected because of non-deployment of competent & qualified safety personnel in appropriate numbers.

3.1.5 Implementation, Inspection/Monitoring

a) The Contractor shall be fully responsible for planning, reporting, implementing and monitoring all HSE requirements and compliance of all laws & statutory requirements.

b) The Contractor shall also ensure that the HSE requirements are clearly understood & implemented conscientiously by their site personnel at all levels at site.

c) The Contractor shall ensure physical presence of their field engineers / supervisors, during the continuation of their contract works / site activities including all material transportation activities. Physical absence of experienced field engineers / supervisors of Contractor at critical work spot during the course of work may invite halting / stoppage of work.

d) The Contractor shall regularly review inspection report internally and implement all practical steps / actions for improving the status continuously.

e) Contractor skilled workmen like riggers, scaffold erectors, welders, crane operators etc. should have sufficient past experience and skill on the relevant job.

f) The Contractor shall ensure important safety checks right from beginning of works at every work site locations and to this effect format No. HSE-10 "Daily Safety Check List" shall be prepared by field engineer & duly checked by safety personnel for conformance.

g) The Contractor shall carry out inspection to identify various unsafe conditions of work sites/machinery/equipment's as well as unsafe acts on the part of workmen/supervisor/engineer while carrying out different project related works.

h) Adequate records for all inspections shall be maintained by the Contractor and the same shall be furnished to EIL/Owner, whenever sought.

i) To demonstrate involvement/commitment of site management of Contractor, at least one Monthly Safety Walk through in a month shall be carried out by Contractor's head of site (along with his area manager/field engineers)and a report shall be furnished to EIL/Owner as per format No: HSE-1" Safety walk through report" followed by compliance for unsatisfactory remarks.

j) As a general practice lifting tools/tackles, machinery, accessories etc. shall be inspected, tested and examined by competent person(approved by concerned State authorities) before being used at site and also at periodical interval (e.g. during replacement, extension, modification, elongation/reduction of machine/parts, etc.) as per relevant statutes. Hydraulic Mobile Crane, cranes, lifting machinery, mobile equipment's/ machinery/ vehicles, etc. shall be inspected regularly by only competent / experienced personnel at site and requisite records for such inspections shall be maintained by contractor. Contractor shall also maintain records of maintenance of all other site machinery (e.g. generators, rectifiers, compressors, cutters, etc.) & portable tools/equipment's being used at project related works (e.g. drills, abrasive wheels, punches, chisels, spanners, etc.).The Contractor shall not make use of arbitrarily fabricated 'derricks' at project site for lifting/ lowering of construction materials.

k) Site facilities /temporary. installations, e.g. batching plant, cement godown, DG-room, temporary electrical panels/distribution boards, shot-blasting booth, fabrication yards, etc. and site welfare facilities, like labour colonies, canteen/pantry, rest-shelters, motor cycle/bicycle-shed, First-aid centers, urinals/toilets, etc. should be periodically inspected by Contractor (preferably utilizing HR/Admin. personnel to inspect site welfare facilities) and records to be maintained.

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3.1.6 **Behaviour Based Safety**

a) The contractor shall develop a system to implement Behavior-Based Safety (BBS) through which work groups can identify, measure and change the behaviors of employees and workers towards construction safety aspects.

b) The BBS process shall include the following:
- Identify the behaviors critical to achieve required safety performance.
- Communicate the behaviors and how they are performed correctly byall
- Observe the work force and record safe/at risk behaviors. Intervene with workers to give positive reinforcement when unsafe behaviors are observed. Provide coaching/correction when at risk behaviors are observed
- Collect and record observation data
- Summarize and analyze observation data
- Communicate observation data and analysis results to all employees
- Provide recognition or celebrate when safe behavior improvements occur
- Change behaviors to be observed or change activators or change consequences as appropriate.
- Communicate any changes to workforce

c) Contractor through its own HSE committee shall implement the above process.

d) The necessary procedures and Monthly reporting formats shall be developed by the contractor for approval by EIL/Owner.

e) The HSE committee of contractor shall observe individual's behavior for safe practices adapted for utilization/execution of work for followings a minimum:-
- PPE
- Tools & equipment's
- Hazard Identification & control
- House keeping
- Confined space entry
- Hot works
- Excavation
- Loading & unloading
- Work at height
- Stacking & storage
- Ergonomics

f) EIL/Owner and Contractor's site staff at all levels shall monitor the behavior of contractor employees that create and/or contribute to the unsafe situations at work place.

g) Contractor shall arrange Behavior Based safety (BBS) training of their employees at site on yearly basis.

3.1.7 **Awareness and Motivation**

a) The Contractor shall promote and develop awareness on Health, Safety and Environmental protection among all personnel working for the Contractor.

b) The contractor shall display safety statistics board at all prominent location .Also shall provide dedicated notice board for displaying of safety alerts or any other safety related notices for awareness site workforces.

c) Regular awareness programs and fabrication shop/work site meetings at least on monthly basis shall be arranged on HSE activities to cover hazards/risks involved in various operations during construction.

d) Contractor's workmen & supervisory staff shall participate in common Tool Box Meeting as & when organized/required at site to avoid any incident/accident or occupational disease arising out of multidisciplinary jobs/activities being performed by various contracting agencies in the same location at different elevation.

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e) Contractor to motivate & encourage the workmen & supervisory staff by issuing/ awarding them with tokens/ gifts/ mementos/ monetary incentives/ certificates etc. The motivational program shall be organized on regular basis.

f) Contractor shall assess & recognize the behavioral change of its site engineers / supervisors periodically and constantly motivate / encourage them to implement HSE practices at project works

g) Life Saving Rules (refer Appendix-I for details) are to be displayed at prominent location of site.

3.1.8 **Fire Prevention & First-Aid**

The Contractor shall deploy First aider & suitable First-aid measures such as First Aid Box (Refer Appendix-B for details), stand-by Emergency Vehicle. Additionally separate ambulance with trained personnel/male or female nurse to administer First Aid shall be provided by the Contractor beyond deployment of 500 workmen during day/night working hours.

a) The Contractor shall arrange installation of fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate portable fire extinguishers (Refer Appendix-C for details) to the satisfaction of EIL/Owner.

b) The Contractor shall arrange EMERGENCY MOCK DRILL like fire, bomb threat, gas leakage, earth quake, etc. at each site at least once in three months, involving site workmen and site supervisory personnel & engineers. The Contractor shall maintain record of such mock drills at project site.

c) The contractor shall require to tie-up with the hospitals located in the neighborhood for attending medical emergency.

3.1.9 **Documentation**

The Contractor shall evolve a comprehensive, planned and documented system covering the following as a minimum for implementation and monitoring of the HSE requirements and the same shall be submitted for approval by owner/EIL.

- HSE Organogram
- Site specific HSE Plan
- Safety Procedures, forms and Checklist. Indicative list of HSE procedures is attached as Appendix :H
- Inspections and Test Plan
- Risk Assessment & HIRAC for critical works.
- HIRAC Register as per Format no: HSE-19 to identify, assess, analyze & mitigate the construction hazards& incorporate relevant control measures before actually executing site works.
- Environmental Aspect Impact Register as per Format no: HSE-18 (identify, assess, analyze & mitigate the environmental impact & incorporate relevant control measures).
- Legal Register to identify and comply to all applicable HSE related legal requirements.

The monitoring for implementation shall be done by regular inspections and compliance of the observations thereof. The Contractor shall get similar HSE requirements implemented at his sub-contractor(s) work site/office, if applicable. However, compliance of HSE requirements shall be the responsibility of the Contractor. Any review/approval by EIL/Owner shall not absolve contractor of his responsibility/liability in relation to fulfilling all HSE requirements.

3.1.10 **Audit**

Safety Audit shall be conducted at initial stage by EIL/Owner to understand the readiness to start the job after mobilization of contractor's RCM at site& Suitable action shall be taken by contractor to comply the audit observation(s).

The Contractor shall submit an Audit Plan to EIL/Owner indicating the type of audits covering following as minimum:

Signature Not Verified
Digitally signed by MD MAZHER ALI
Date: 2026.03.17 18:03:35 IST
Location: eProcure-EPROC

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